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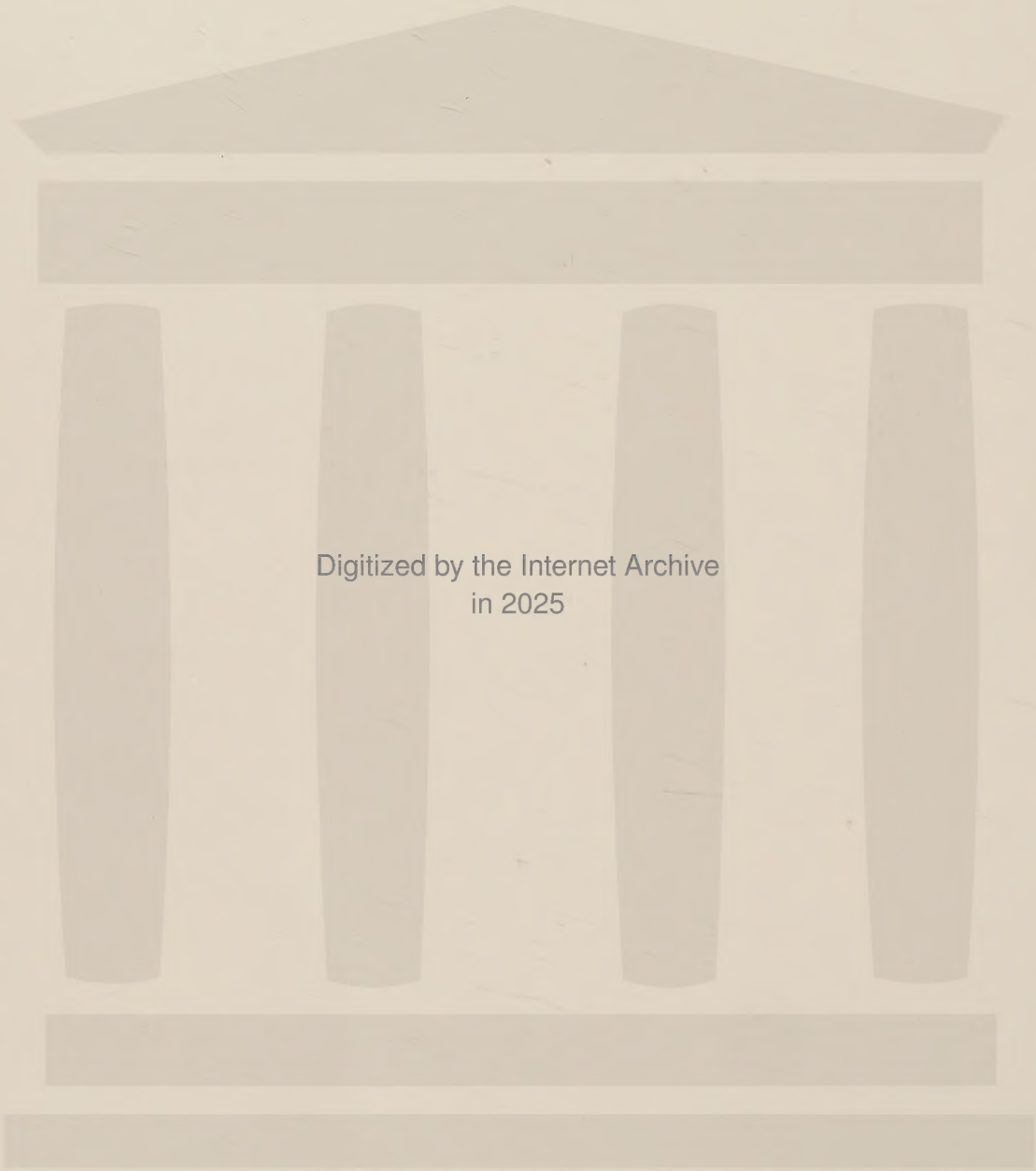
RESOURCE APPRAISAL AND FISHERY STATISTICS

General Fisheries Council for the Mediterranean (GFCM)

Rome, 30 January - 3 February 1978

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS



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REPORT

of the

SEVENTH SESSION OF THE WORKING PARTY ON RESOURCE APPRAISAL AND FISHERY STATISTICS

of the

GENERAL FISHERIES COUNCIL FOR THE MEDITERRANEAN

Rome, 30 January - 3 February 1978

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THIS REPORT

This is the final version of the report of the Seventh Session of the General Fisheries Council for the Mediterranean (GFCM) Working Party on Resource Appraisal and Fishery Statistics held in FAO, Rome, from 30 January to 3 February 1978.

It is the second report of a session of this Working Party to be published in the Series FAO Fisheries Reports.

Distribution

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GFCM member countries
Other countries and interested national and international organizations
FAO Fisheries Department
Fishery Officers in FAO Regional Offices

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TABLE OF CONTENTS

		Page
I -	INTRODUCTION	1
II -	LEGAL MESH SIZES AND MESH SIZES IN CURRENT USE IN THE MAIN NATIONAL TRAWL FISHERIES	1
III -	ANALYSIS OF THE STATE OF THE STOCKS	3
	Sub-area 37.1 - Balearic	3
	- Total catches	3
	- Fishing effort	4
	- Assessments	4
	- Improvement of data	6
	Sub-area 37.2 - Gulf of Lions	7
	- Demersal fishing	7
	- Pelagic fishing	8
	Sub-area 37.3 - Sardinia	9
	- Demersal fishing	9
	- Pelagic fishing	10
	Sub-area 37.4 - Adriatic	11
	- Demersal fishing	11
	- Pelagic fishing	12
	Sub-area 37.5 - Ionian	13
	- Demersal fishing	13
	- Pelagic fishing	15
	Sub-area 37.6 - Aegean	16
	Sub-area 37.7 - Levant	17
	- Total catches and catch composition	17
	- Demersal fishing	17
	- Pelagic fishing	17
	- Total catches	17
	- Effects of the decrease in the discharge of the Nile	17
	- Stock assessment	18
	Sub-area 37.8 - Black Sea	18

TABLE OF CONTENTS (Contd.)

		Page
IV -	CONTROL OF THE LEVEL OF EXPLOITATION	19
V -	IMPROVEMENT OF STATISTICS	20
	- Catches	21
	- Fishing effort	22
	- Biological sampling	22
VI -	EXPLORATORY SURVEYS	22
	- Trawl fishery surveying	23
	- Acoustic surveys	23
	- Surveying of eggs and larvae	23
	- Tagging	24
	- Liaison with the structures concerned in biomass surveying	24
VII -	OTHER MEASURES WHICH COULD PROMOTE THE ACTIVITIES OF THE WORKING PARTY	25
VIII -	OTHER MATTERS	26
	- Fishing vessels and gear used in the Mediterranean	26
	- Presidence	26
IX -	ADOPTION OF THE REPORT	27
Statistical Tables		29
Figures		51
ANNEX 1:	List of Participants	65
ANNEX 2:	Agenda	67
ANNEX 3:	Renseignements fournis par les participants sur les maillages légaux et ceux couramment utilisés dans les pêcheries nationales au chalut de fond	69
ANNEX 4:	Méthodes de mesure du maillage - Mesures comparatives de l'ouverture de maille dans les poches de chalut	73
ANNEX 5:	Table 1a - Inventory of data at present available on bottom trawl fisheries	79
	Table 1b - Inventory of data on bottom trawl fisheries which will tentatively be collected by the members of the Working Party before June 1978 or January 1980	80
ANNEX 6:	Bulgarian research report (by Mrs. K. Alexandrova)	81
ANNEX 7:	Evaluation des ressources en turbot, Scophthalmus maeoticus (Pallas), devant la côte bulgare de la mer Noire et mesures de surveillance (par L. Ivanov et M. Karapetkova)	83

TABLE OF CONTENTS (Contd.)

		Page
ANNEX 8:	On the reproduction cycles of the Black Sea sprat and their control (by S. Stoyanov)	105
ANNEX 9:	Cyprus - National research report (by A. Demetropoulos)	111
ANNEX 10:	A summary report on the routine sampling programme for sardine and anchovy in the Adriatic (by D. Levi)	115
ANNEX 11:	Progrès réalisés au plan national et armement marocain en Méditerranée (par J. Hamou-Tahra)	119
ANNEX 12:	Données disponibles sur les poissons pélagiques de la côte nord marocaine (par R. Biaz et M. Rami)	125
ANNEX 13:	Rapport sur la réunion de travail pour le dépouillement des statistiques sur la pêche italo-tunisienne dans la sous-zone 37.5 - Ancône, Italie, 12-16 décembre 1977 (par M. Bouhlal)	139

I - INTRODUCTION

1. The GFCM Working Party on Resource Appraisal and Fishery Statistics met at FAO Headquarters, Rome, from 30 January to 3 February 1978. The participants were welcomed by Mr. L.I.J. Silva, Assistant to the Assistant Director-General (Fisheries Department). Mr. A. Demetropoulos, who chaired the session, thanked him on behalf of the participants. The list of participants is given in Annex 1.

2. The agenda proposed was adopted (Annex 2).

II - LEGAL MESH SIZES AND MESH SIZES IN CURRENT USE IN THE MAIN NATIONAL TRAWL FISHERIES

3. At its first session (February 1976), the GFCM Committee on Resource Management recommended that the member countries of the GFCM take steps to forbid the use of trawls with a mesh opening of less than 40 mm. In order to ascertain the effects of this request, the Working Party reviewed the decisions taken by the various countries regarding the regulation of mesh measurements effected at national level. The information thus collected is given in Annex 3.

4. This information and the discussions which followed showed that as a general rule the GFCM recommendation has been well reflected in national laws. Its implementation, however, appears to be decidedly less satisfactory. Among the main reasons mentioned to explain this situation was the traditional reluctance of the fishermen to adopt larger size meshes, the frequent inadequacy of controls and, sometimes, a lack of contacts and exchanges of view on these matters between fishermen, research workers and those responsible for control.

5. The Working Party analysed the various factors which condition trawl selectivity and pointed out that, particularly in the traditional Mediterranean trawls, the mesh size of the codend was far from being the only determining factor. The mounting and certain assembly devices play a very important role.

6. It was pointed out that the improvement of fishing operations through the choice of mesh size presupposed knowledge of at least:

a) The mesh size currently used in the main fisheries

b) The length composition (annual average) of the main species entering these fisheries and, above all, of the smaller-sized species, for which the use of a mesh size of 40 mm might be open to question

c) The selectivity of the main kinds of trawls vis-à-vis these various species.

7. There was a long discussion on the reticence shown by various groups of fishermen as regards programmes aimed at determining or checking the mesh size really used. In this connection, it was recalled that it is necessary to distinguish these programmes, which have a scientific purpose, from controls with a coercive purpose, and to convince the fishermen that the information collected by the research workers could not later be used against them. The rules of statistical secrecy which exist in most national legislations usually make it possible to ensure anonymity, particularly when this is essential for the success of a scientific survey. In a more general way, it was recalled that in order for a law on mesh size to be implemented effectively, it is necessary that a majority of the fishermen concerned be convinced that in the long run they will be the first to benefit from it. Better communication between research workers and fishermen, therefore, cannot but facilitate such understanding.

8. The Working Party further noted that examination of the national inventories of existing data on the mesh sizes actually used by trawl fisheries showed that in several cases the research bodies did not yet have such data and were not planning to undertake such measurement programmes.

9. When such measurements are made, it is usually in connection with occasional controls by the administrative services responsible for supervision or by the fishery police. The aim of these controls is to verify whether the mesh conforms with regulations or not. They therefore do not produce data on average mesh value figures, values which would be of interest for the scientific bodies. The Working Party therefore recommended that the GFCM Committee on Resource Management examine this problem at its next session. It hoped that the bodies responsible for control would follow the directives laid down in paragraph 1 of Resolution I/76/1 of the First Session of the Committee 1/ and in particular collect all the values of the measurements of meshes carried out, whether these conform with regulations

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1/ Resolution I/76/1:

"The Committee on Resource Management of the General Fisheries Council for the Mediterranean recommends that its Member States introduce in their legislation the following regulations:

1 Persons and vessels under their jurisdiction shall not use, while fishing in the area of competence of the GFCM, any trawls the mesh opening of which is less than 40 mm measured as prescribed hereafter: The opening of the mesh will be measured, preferably with the International Council for the Exploration of the Sea (ICES) gauge; for inspection purposes a flat wedge gauge may also be used, provided that it is calibrated on the basis of the ICES gauge, the measurements of which will serve as reference; the measurement of the mesh opening of a net shall be taken by the average of the measurements of any series of 20 consecutive meshes situated on the top side of the codend along a line running parallel to its longitudinal axis, and starting from the aft end of the codend, at a distance of at least five meshes ahead of the aft end of the codend; the line should not be located near the selvedges, and meshes near to the strengthening ropes or lacings should not be measured; nets shall be measured wet and after use

2 Persons and vessels under their jurisdiction, when fishing with nets in accordance with the norms set in paragraph 1 above, shall not use any means or device which would obstruct or close the meshes or otherwise have the effect of diminishing the selectivity of the codend; however, the use of chafers made of netting or other material attached to the under-side only of the codend to reduce and prevent damage to the net will be permitted, as well as that of external covers, expressly provided that the mesh opening of such a cover be at least three times larger that of the mesh opening of the codend and that its stretched width be between 100 and 150 percent of the stretched width of the codend

3 To avoid impairment of fisheries aimed at catching species too small to be properly exploited with the 40 mm mesh opening, the use of smaller meshes may be authorized, provided that for each case detailed justifications shall be given spelling out the conditions under which such exemptions are granted, referring in particular to species, minimum mesh size, fishing seasons and areas, minimum percentage of the species in total catches. In addition, analysis should be made of the long-term effects on catches, in weight and value, of the species in question as well as of other species caught at the same time, which can be expected from the use of the smaller mesh as well as the 40 mm mesh opening

The GFCM will be kept informed of the exemptions granted"

or not, and transmit them to the scientific bodies concerned. The Working Party also recommended that, wherever necessary, research bodies and fishery control services consult with each other in order to fix joint standards for measuring the mesh size of the nets inspected, taking into account the GFCM recommendation on this matter and the need to have a better knowledge of the mesh sizes really used.

10. The results of an experiment on standardization of measurements using the ICES gauge and the flat triangular gauge were communicated. They are given in Annex 4.

11. Regular programmes for measuring catches are little developed as yet, at least for the demersal species (the situation is better as regards the pelagic species which are easier to sample). The Working Party decided to make an inventory, by species and by (bottom trawl) fisheries, of the length distributions available, as well as of those which should be available in the next six months and in the next two years (Tables 1a and b of Annex 5).

12. It was recalled that selectivity data had been presented in the report of the Fourth Session of the Working Party. The Working Party decided to bring this inventory up to date. A first list is given in Annex 5. Il also requested the Secretariat to assemble the selectivity data available in the various countries - or references to publications in which these data are published - and to transmit them to the members of the Working Party.

13. This set of data will be used at the next session to study the effects of changes in mesh size on trawl fishing. The participants were, in fact, of the opinion that it was urgent to promote such studies.

III - ANALYSIS OF THE STATE OF THE STOCKS

Sub-area 37.1 - Balearic

Total catches

14. The statistics on the total catches made by the various countries (Algeria, Spain - continental Spain, the Balearic Islands, Ceuta and Melilla - and Morocco) fishing in the sector have been brought up to date (Table 1). With the data from Table 1 in the report of the Sixth Session (p. 33), a chronological series covering the period 1964/76 is now available. These date are broken down in accordance with the list of species approved by the GFCM.

15. According to these date, the preponderance of Spanish fishing reported for the period 1964/73 is beginning to decrease in the pelagic sector, but seems to be continuing in the demersal sector. According to the official figures (Table 1), demersal catches for the sub-area as a whole have fallen sharply during the last two years (25 and 27 000 tons as against 46 000 tons in 1974).

16. The same is true as regards pelagic catches (60 and 66 000 tons as against 95 000 tons in 1974). These decreases are to be attributed essentially to the official Spanish fishing statistics, but it is not sure whether these figures correctly reflect recent trends in Spanish fishing. The data of the Standing Commission on Mediterranean Fishing (Spain), which appear in Table 2 and which should be more correct, show, rather, general stability after a temporary fall in trawler catches and a noticeable expansion (+ 40 percent over fice years) in catches by purse seiners.

17. Although the majority of the Spanish catches come from the Spanish continental shelf, a certain quantity of shrimp are captured on the Algerian continental shelf, while almost half the trawlers based on Málaga and Almería fish along the Mediterranean coasts of Morocco. Some trawlers from Alicante, Castellón, and above all Málaga, operate in the

Atlantic and land their catches in Málaga. Part of the demersal catches (about 25 percent in 1977) landed in Málaga and recorded as Mediterranean yields therefore come from the regions covered by the Fishery Committee for the Eastern Central Atlantic (CECAF) and the North-East Atlantic Fisheries Commission (NEAFC).

18. According to the statistics officially submitted by Spain to FAO, certain catches landed in Catalonia come from division 37.2 - Gulf of Lions. After checking with the Spanish statistical office, it appears that those catches actually come from sub-area 37.1 and have been attributed by mistake to sub-area 37.2.

Fishing effort

- Available statistics

19. The fishing power of the trawlers based at certain Spanish ports (Alicante, the Balearic Islands) and the activity - in days at sea - of the purse seiners operating in the sector of Almería, Málaga and the Balearic Islands are known (Tables 3 and 5). In addition, changes in the Spanish fleets of trawlers and purse seiners and in their activity as compared with the figures for 1971 are given in Table 4.

20. The total number of purse seiners and trawlers based at Al Hoceima (Morocco), as well as their gross tonnage, average engine power and the number of fishing days, are also known (Tables 6 and 7).

- Additional information

21. In Spain, the increase in fishing effort recorded from 1964 to 1971 continued up to 1976. The number of trawlers rose from 1 086 in 1971 to 1 125 in 1975, while their average tonnage rose by one-third and their engine power by about 40 percent. According to the data supplied by the Spanish Standing Commission on Mediterranean Fishing, powerful trawlers (up to 1 000 hp) have recently been launched. The average power of the fleet seems now to be about 200 hp.

22. The number of Spanish seiners, on the other hand, seems to have decreased by 16 percent. However, this decrease in numbers is more than offset by an increase in activity, the number of days at sea for the fleet as a whole being continually on the rise.

23. The Moroccan shipping report, submitted by J. Hamou-Tahra (Annex 11) shows that important changes occurred in the Moroccan fleet during the period 1974-1977. The number, size and engine power of the boats increased by about 50 percent.

Assessments

- Demersal fishing

24. Given the statistics available, updating of the existing assessments of demersal stocks had to be limited to the Spanish fishery. Overall, the state of the stocks does not seem to have changed much since 1975. According to the relationship between cpue and effort given in the report of the previous session (Section 3.1.3), the size of the fleet, measured in engine power, is still greater than that (220 000 hp) which corresponds to the maximum sustainable yield.

25. The economically most important species on the slope is the red shrimp (Aristeus antennatus). The catch and effort statistics for the vessels based at the Balearic Islands (Majorca) on the one hand and on Alicante and Ibiza on the other are given in Table 3. A production model (Gulland method, linear and exponential functions, reduced major axis) has been applied to these two sets of data (Figures 1 and 2).

26. The data relating to Majorca show that the fishing effort seems to have increased greatly during recent years. Unless this is due to an over-estimate of the effort made by the vessels based at continental Spain, it would seem that the stock is being over-exploited. It would be advisable to return to a level of activity equivalent to that which prevailed in the early sixties. If such a reduction in activity could be achieved rapidly, it would be possible to check in a fairly short time whether this measure has beneficial effects on yield. Given the short life-cycle of the shrimp, it would even be possible to carry out a series of trial and error experiments to ascertain the maximum equilibrium yield.

27. Owing to the impossibility of separating the landings in Alicante from those in Ibiza, the data for these two ports have been processed together, although the vessels based at these two ports fish different parts of the continental shelf. The series of data show a more regular fall in average abundance under the effects of exploitation (Figure 2). This sector is apparently being fished to the maximum possible. It would be advisable to take care to see that the effort here does not increase.

- Pelagic fishing

28. This concerns primarily sardine.

29. Almost no progress has been made in ascertaining the identity and distribution of the stocks in this sub-area. A comparison has been made of the cpue trends at Al Hoceima, Málaga, Almería and the Balearic Islands, ports for which such data are available (Figure 3). But the periods of observation are either short or do not overlap sufficiently. It is to be noted, however, that the yields remain very stable everywhere, despite considerable short-term fluctuations (except in the Balearic Islands). The stability of the Balearic yields may be attributable to the difficulties of marketing the catch. However, it is impossible to draw from these comparisons any conclusion regarding the possible relationship between the various concentrations exploited in the sub-area. There are, however, a few indications (hydrological conditions in the Alboran Sea, vertebral averages) that the concentrations along the African coasts and those along the European coasts belong to separate stocks. It is on the bases of these slender indications that it has been preferred to do separate analyses.

30. Owing to the lack of recent data, it has not been possible to bring up to date the analysis of the Castellón fishery given in the report of the Sixth Session (Section 3.1.3, page 7). This is to be regretted because this stock is particularly important, as it attracts the majority of the purse seiners of southern Spain.

31. An attempt has been made to apply a production model to the fishing statistics for the Balearic Islands, but this has not produced convincing results. On the other hand, an acoustical survey was carried out in 1975[1] and completed by calibration in 1977[2]. This led, for the area South of Majorca, to an estimate of the total pelagic biomass in the order of 30 000 tons, of which about 30 percent is sardine. Comparison of these figures with present yield (total: 1 000 t; sardine: 400 t) indicates that the stock is being only moderately exploited.

32. Catch and effort data for the Spanish purse seiners operating from various Spanish ports on the Alboran Sea have been assembled for the first time (Table 5). Unfortunately, these data are still far too incomplete. It is impossible to estimate from them either the total catches or the total effort, and hence no assessment can be attempted. During recent

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1/ Oliver, P. and J. Bravo de Laguna, First experiments on fish stock assessment on 1976 acoustic methods around Balearic Islands. General Fisheries Council for the Mediterranean - Thirteenth Session, Rome 28 June-3 July 1976, GFCM/XIII/76/Inf. 8-8p.

2/ In preparation

years, a great increase in catches of class 0 specimens has been observed. It is impossible to say what will be the consequences of the continual lowering in the average age for first catches, but as it may prove harmful, it is important to follow the development of this exploitation and to complete without delay the statistical series relating to landings in the various ports. The same thing is occurring in catches of red mullet; in this case, data on the extent of the phenomena have been collected (Figure 4).

33. In this sector there has been a fall in the yield of the other pelagic species such as anchovy, frigate mackerel and bonito.

34. The catch and effort data for the Moroccan fleet based at Al Hoceima are given in Table 7. A production model has been applied to them (Gulland method, linear and exponential functions, reduced major axis) (Figure 5). The points relating to the period before 1972 are scattered perpendicular to the cpue/f relationship. In fact, the fleet did not grow significantly until after this period - and no data on effort from 1972 to 1973 are available.

35. These limitations apart, the present effort would seem to have attained or even exceeded the maximum yield level, which would seem to be barely 9 000 tons.

36. The poor quality of the data reduces the confidence that can be placed in this assessment. However, it should be pointed out that the cpue have decreased appreciably since the increase in effort that has taken place in recent years. In addition, a first application of cohort analysis (see the report by Biaz and Rami, Annex 12) suggests that the fishing mortality coefficient is now (1975-77) in the order of 0.4-0.5, i.e. equal to the natural mortality coefficient, estimated at 0.4 (Taylor's formula, $K = 0.35$, $t_o = -2.4$ years). Although this analysis is strictly preliminary (no cohort has yet been followed throughout its existence), the estimates of F to which it leads have distinctly increased during recent years, parallel to the effort measured. All this information together suggests that the stock is already being exploited fairly intensively.

37. It would therefore seem wise to put a halt to the development of this fishery for a few years (2 or 3), so as to be able to evaluate its potential more accurately and avoid the risk of over-exploitation.

Improvement of data

38. The Working Party laid great emphasis on the fact that the improvement of assessments depended essentially on making progress in the collection of fishery statistics and biological data. Given the high level of exploitation to which many stocks were subjected, it considered that it was vital for the future of fisheries to make this effort, and that priority should be given to the following tasks:

39. The missing Spanish statistics on catch and effort (Castellón, Alicante, Málaga, Almería, etc.) should be quickly assembled and processed by fishing sector and no longer by port of landing. Spain has a network for the collection of data on catches per species and fishing effort - expressed in fishing days, number and power of the vessels - which covers the Spanish Mediterranean coast as a whole. These statistics, collected by the "Comisión Permanente de Pesca del Mediterráneo"1/, are more complete and reliable than those officially transmitted to FAO. It would be desirable for these data to be assembled according to the different statistical sub-areas and the criteria drawn up by the GFCM. they could then constitute the data which Spain would officially submit to the GFCM. Their reliability could be tested by comparing them with data specially and carefully collected in test strata (ports, months, fisheries, etc.). There is also a network of information workers in the Spanish ports on the Alboran Sea which, from 1978 on, will be extended to the Alicante region; in this network data on catch and effort are collected as a matter of routine and biological sampling work (length distributions) is due to start any time.

1/ Standing Commission on Mediterranean Fishing

40. The national authorities responsible for sub-area 37.1 should try to determine better indices of abundance of the main stocks exploited, by trying to improve effort measurements and by comparing catches per unit of effort with indices deriving from independent sources (acoustic surveys, for example).

41. Before any assessment, it is first necessary to have a more thorough knowledge of the identity and distribution of the pelagic and demersal stocks. Acoustic survey and exploratory trawling cruises should be conducted jointly by the Spanish and the Moroccan research institutes. The responsible national authorities have pledged themselves to exchange information on their respective programmes in order to facilitate the formulation of a coordinated research programme. The Working Party also suggested that a meeting of Spanish and Moroccan scientists concerned be held before its next session in order to reduce the work of data coordination during the session itself.

Sub-area 37.2 - Gulf of Lions

Demersal fishing

42. In 1975 and 1976 Spain declared separate catches for the 37.2 sub-area. But since the validity of this break-down could not be confirmed by the Spanish research workers[1/], it was preferred to consider still only the Franch data for sub-area 37.2. These data have been processed according to the procedure adopted at the previous sessions.

- Available data

43. The quality of the data available for 1975 and 1976 is the same as that of the preceding years; all the comments on available data made by the Working Party at its Sixth Session are still valid. Therefore, the chronological series have been brought up to date, keeping the same form as that adopted in November 1975. Thus, on the one hand sub-area 37.2 has been examined (total catch, total effort expressed in engine power) as a whole; and on the other hand, taking into account observations already made concerning the profound differences between the eastern and western sectors of this sub-area, trawl fishing (to the exclusion of other fishing methods) only in the Gulf of Lions strictly so called has been analysed separately. The updated chronological series presented in Table 8 are therefore uniform.

- Data analysis

44. Fishing effort expressed in total trawler engine power has continued to increase slightly as foreseen, the former vessels with a unit power of less than 300 hp being replaced at the time of new construction by trawlers equipped with the maximum power authorized by the equipment licence (400 hp). The corresponding catches also increased in 1975, then decreased in 1976, although they remained higher than those obtained before 1975.

45. The cpue values after 1973, flotted against the average effort over two years, are higher than the regression registered at the time of the preceding session (Figure 6). High yields had already been noted in 1974. The assumptions put forward then are still valid; that referring to the increase of the catchability coefficient (and therefore a relative underestimate of fishing effort) should certainly not be rejected, given the now widespread use of 4-panel (high vertical opening) trawls which make possible catches in depth ranges that had previously been little if at all fished by trawlers. However, a study of the relative importance of pelagic species (mainly sardine, anchovy and mackerel) in trawler catches of the port of Sète (which alone accounted for 36 percent of the catches made in 1976 in the Gulf of Lions strictly so called) shows a distinct increase of these species in bottom trawl catches since 1974, when the 4-panel trawl started to come into general use. On the graph summarizing this evolution (Figure 7) two species (mullet and white seabream) have been included which, although bottom-feeders, are more vulnerable to the new techniques and whose concentrations are undoubtedly more actively sought by vessels equipped with the new trawls.

1/ After the meeting Mr. P. Oliver checked this query with the Spanish statistical office. He confirmed that the catches reported by Spain as caught in Sub-area 37.2 actually come from Sub-area 37.1

46. On the other hand, there are no data or observations to justify an assumption that the age distribution of fishing mortality might have improved.

Pelagic fishing

- Available data

47. The chronological series submitted in November 1975 have been brought up to date along the same lines (Table 8). Only the figures referring to sardine, which represent the bulk of the landings, have been taken into account in the analyses. Since the data on the fishing effort of the purse seiners are recorded more exactly in certain sectors of sub-area 37.2, it was preferred, as previously, to use the figures only for the districts of Port-Vendres, Sète and Marseille, where the bulk of the fishing is concentrated. The comments on the interpretation of these figures made at the previous session of the Working Party (page 10 of the report) remain valid. In indicating the number of standard vessels, account has been taken of a modification that has taken place in the composition of the fleet, the so-called "catalanes" having practically disappeared in the sector under consideration. An attempt was made to analyse the fishery taking into account the total sardine catch made not only by the purse seiners but also by the trawlers. This study did not prove to be feasible, the statistical data - from different sources - being incompatible. Statistics representing the total sardine catch will have to be prepared for the next session. In interpreting the results account has been taken of new information available on the age composition of the commercial catches.

- Data analysis

48. In 1975 and 1976, a decrease in yields is to be noted, while the effort, expressed in number of vessels x positive fishing days, on the increase as compared with 1974, is fairly close to the value attained in 1973. The 1974 value, particularly low, affects all the past-1973 averages of effort (calculated on a 3-year period) in which this value is taken into account.

49. The absence of an increase in effort in 1975 and 1976 by comparison with 1973 is attributable to economic causes, particularly marketing difficulties. The assessment submitted by the Working Party at its Sixth Session remains valid. The present yield of this fishery is moderate and it seems that, based on the data used, the maximum potential yield (about 20 000 tons) could be achieved with an effort about three times greater than the present one. A study of the age composition of the commercial catches[1/] carried out in the three main ports (see Figure 8), by revealing a certain stability in the demographic structure of the stock, confirms the low yield rate noted for this fishery. The distributions in Figure 8 also suggest that an average effort calculated on the basis of four years would correspond better to the yield rate (age groups), now prevailing.

50. The authorization given to some vessels in 1977 to practice pelagic pair-trawling (forbidden in the French Mediterranean since 1970) will undoubtedly, if this experiment is continued, modify the yield rate and pattern of exploitation of this fishery in the coming years. In this connection, the Working Party recommended that a statistical programme be launched forthwith in order to be able to monitor the development of this fishery satisfactorily.

1/ Pichot, P. et Y. Aldebert, La pêche de la sardine en Méditerranée française. Science et Pêche. Bulletin d'information de l'I.S.T.P.M. 1978

Sub-area 37.3 - Sardinia

Demersal fishing

- Available data

51. France has produced for the Corsican fishery data on total demersal catches for the period 1959-1976, together with statistics on the number, tonnage and engine power of the vessels (Table 9).

52. Italy has completed the data submitted at the previous session (Table 10). However, the statistics for 1975 and 1976 can be compared with the previous figures only as regards catches. For the data on effort, the shifting from sub-area 37.3 to sub-area 37.5 of about ten "Atlantic" (gross tonnage over 200) - which is not taken into account in the official statistics - must have introduced an appreciable bias into the estimate of the gross tonnage of the Italian trawlers working in the various sub-areas.

53. Tunisia has submitted statistical data on total yield and yield per species for the period 1967-1976 and measurements of effort expressed in number of boats, average gross tonnage and number of days spent at sea per year (Table 11).

- Assessments

54. Using the data described above, an attempt was made to see whether the effort exerted by the Italian and Tunisian fleets could be expressed in Italian units which would make it possible to estimate the total effort even for the years after 1967 for which only Italian data are available. To achieve this, a comparison was made of the trends in cpue (effort in gross tonnage) for Corsica, Italy and Tunisia over the period 1967-76. As the trends are not parallel, the analysis of the longest chronological series (1959-1976) had to be limited to the Italian data. Such decision was based on the observation that the Italian catches are far larger than the Tunisian and Corsican ones. The overall model was then applied to the total catches (Corsica, Italy and Tunisia) for the years 1967-1976, the total effort being expressed in Italian units. Two analyses were attempted: one considering the average effort over two years, the other the average effort over three years. Considering the above-mentioned discrepancies in the trends of the various cpues, the following findings ought to be treated with caution.

- Results

55. It can be seen immediately that the variation in effort observed is slight: in both cases it covers only about one-third of the interval between the origin and the effort corresponding to the maximum possible yield. The linear and semi-logarithmic regressions have non-significant coefficients of correlation ($P < 0.05$). It would therefore be risky to draw conclusions from this analysis. The result should, however, be checked when the definitive data on the Italian effort for 1975 and 1976 are available. As the major part of the Italian demersal catches consist of a mixture of species which do not appear in the list of commercially important species for which detailed data have been produced. There is no much justification to carry out a more detailed analysis by species using the existing data.

56. The total yield and fishing effort (tonnage) data of the three countries fishing in sub-area 37.3 have been analysed. The regression coefficient linking effort to the cpue obtained has a positive value, showing that the index of abundance increases with the fishing effort. This can be explained in several ways: an increase in catch effectiveness; an extension of the fishing area towards fishing grounds which are little exploited; and finally, bias in the available data, particularly as regards the estimate of fishing effort, which, as measured, is not proportional to fishing mortality.

57. The data on Corsican demersal fishing submitted in 1975 have been reviewed and improved. However, it is still not possible to calculate indices of effort and catches separately for trawlers and small-scale fishing boats. As at the previous session, therefore, trawl

fishing and small-scale fishing have been treated together, using the overall gross tonnage as the joint unit of effort. The conclusions reached from the evaluation based on the new data (Figure 9) do not differ from those reached by the previous session. The maximum catch still seems to lie between 1 000 and 1 200 tons; this seems to have been reached in 1975 with an effort of about 1 500 GRT. Although the total yield seems to remain stable, an increase is to be noted in the size of the fleet, which leads, in economic terms, to over-exploitation, at least until the distribution of the fishing effort can be improved.

58. Owing to lack of time it has not been possible to analyse the Tunisian fishery separately. The Tunisian research worker has promised, however, to carry out this evaluation quickly and to communicate the conclusions to the GFCM for distribution to the members of the Working Party.

Pelagic fishing

59. The Italian data on catch and effort have been completed for the years 1975 and 1976 (estimated effort for 1976). The catches are broken down by species and the fishing effort is based on the tonnage statistics (gross registered tonnage) of the fleet (Table 10). The data cover the period 1959 to 1976.

60. The Tunisian data on catch and fishing effort have also been completed for the years 1975 and 1976. They cover the period between 1967 and 1976. The catches are broken down by species and the effort is given in number of trips (Table 12).

61. The series of data for Corsica for the years 1959 to 1976 have been completed by the data for 1975 and 1976. The fishing effort, expressed as the total tonnage of purse seiners, is available only from 1969 (Table 9). The statistics for 1976 should be treated with reserve.

- Data analysis

62. The compatibility of the data from the three countries has been studied (Figure 10). The developments in the cpue being different, no overall analysis has been undertaken.

63. The catches and cpue of the three countries have been analysed in terms of the corresponding fishing effort. Thus for Italy and Corsica the cpue is expressed in tons caught per registered tonnage, while for Tunisia it is expressed in terms of the number of trips (Table 12).

- Results

64. The regression calculated on the basis of the Italian data has a positive coefficient: to each increase in fishing effort corresponds an increase in the cpue. There are several possible explanations for this unusual result: the stock of pelagic fish may be very large and still relatively little exploited; or the estimates of fishing effort may be far from proportional to the fishing mortality. Although the unreliability of the data is obvious, this does not mean that the first possibility can be rejected.

65. The Corsican catches are low, and the fishing around this island has therefore not been analysed.

66. As regards fishing activities in northern Tunisia, the correlation between cpue and effort has too low a coefficient ($r = -0.20$ or -0.23, according to the adjustment function adopted) to be able to consider the relation found as significant. The Tunisian research worker has offered to make a more detailed analysis, studying particularly the specific composition of the catches. He will communicate the results to the GFCM Secretariat for distribution to the members of the Working Party.

Sub-area 37.4 - Adriatic

Demersal fishing

- Analysis of fishery statistics

67. The Yugoslav catch statistics for 1975 and 1976 are not yet available. (The available data on catch by species are not broken down by type of gear and therefore cannot be used to evaluate stocks.) The increase of demersal catches which is known to have occurred during the past two years is probably due to a greater effort by private vessels. The location and duration (fishing days) of the operations of the Yugoslav fleet are recorded on a routine basis. These statistics make possible a more detailed assessment of the fishing effort. The estimates are now being prepared and will be available shortly. In as much as Yugoslav fishery represents no more than 5 percent of the sub-area's total yield, it need not be taken into account in making a first approximate assessment of the state of the stocks.

68. Available catch statistics for Italian fishery show an increase in 1975 and 1976 (Tables 13 and 14). There are indications that, due to a change in Italian tax laws, a larger proportion of the catches may not be passing through the data collection circuits and, to complicate comparison still further, this percentage may not be the same for the various species and in the various ports. This makes it all the more urgent to effect a fundamental improvement in the data collection system.

69. The recent adoption of new (automatic) data processing methods has delayed the production of overall statistics on the tonnage of the Italian trawler fleet in 1975 and 1976. However, on the basis of the statistics for a few ports it seems that variations in the total tonnage of vessels officially engaged in trawl fishery continued to be less than 1 percent. Moreover, it should be recalled that the statistics on total tonnage of the Italian trawlers - the only ones available and used in the preceding reports as indices of effort - also include vessels practising pelagic trawl fishery, either full time or occasionally. Now during the past few years there has been an increase in the number of pelagic trawlers, a decrease in the number of seiners and some reduction in the number of trawlers engaged in demersal fishing. These changes lead to a growing over-estimation of the fishing effort derived from this series of data.

70. If it is agreed that the demersal fishing effort has remained practically stable in the past two years - as suggested by the data available for some ports and as in line with what is known by research workers familiar with Adriatic fishery - then the state of the demersal stocks would seem to have somewhat improved during that period, to a greater extent than suggested by a comparison of the Italian yield figures. This is seen more clearly in the case of some species such as hake, catches of which have increased steadily since 1973.

- Trawl surveys

71. This opinion regarding the present state of the stocks is in agreement with a recent work[1]. Its two authors, using trawl surveying results, evaluated the biomass of an unexploited sector of about 2 000 square miles along the Yugoslav coasts. Using Gulland's approximate formula ($Y_{max} = 0.5\ MB_o$) and allowing for an average natural mortality of 0.3, they obtained a maximum potential catch figure for this sector. The figure was then extrapolated for the Adriatic as a whole. A final estimate in the order of 80 000 tons is thus obtained. Application of a Schaefer model to Italian fishery statistics before 1975 had

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1/ Jukic, S. and C. Piccinetti, Standing stock estimation and yield per exploitable biomass (YEB) forecast of the Adriatic edible demersal resources. Invest. Pesq., Barc. (in press)

showed a potential of the same order, probably underestimated to the same degree as Italian catch statistics (section 3.4.1 of the report of the Sixth Session). The estimate produced by Jukic and Piccinetti should also represent a minimum, since: a) emigration must occur from the unexploited sector to the rest of the Adriatic, and the biomass of the reference sector should be smaller than that which existed before any exploitation; and b) the calculations allowed for a capturability coefficient equal to 1, which is undoubtedly an over-estimate.

72. The conclusions presented in the report of the Sixth Session, to the effect that the maximum sustainable yield level has not yet been reached (see report of the Sixth Session: Figure 9 and Section 3.4.1), are still valid. However, it must be pointed out that these evaluations are extremely uncertain, due to the unreliability of the raw data.

Pelagic fishing

- Analysis of fishery statistics

73. Shortcomings comparable to those already described for demersal fishery affect the statistics for pelagic fishery. The Italian statistics (Tables 13 and 14) underestimate even more the real pelagic fish catches, since it is estimated that more than half do not pass through the auction markets. It is known, however, that pelagic fishery is tending to increase. The absence of utilizable indices of effort has already been pointed out. The Yugoslav data, although slightly underestimated, show an increase in catches. The measurements of effort collected during the last three years through statistical squares are not yet available. However, a certain number of direct estimates for the pelagic species of the Adriatic are available through various kinds of surveys.

- Surveys of eggs and larvae

74. Surveys carried out jointly by Italian and Yugoslav laboratories have made it possible to estimate the number of anchovy eggs laid in 1976 and 1977. The 1976 surveys[1] produced an estimate of the biomass of breeders of more than 930 000 tons. This figure is probably an underestimate, in the sense that no account is taken in the calculations of mortality during development of the egg. The first estimates from the 1977 survey indicate a biomass of more than 1 000 000 tons, again leaving out of account the effects of mortality during development of the egg.

- Acoustic surveys

75. An initial acoustic survey[2] carried out in 1976 by the Laboratorio di Tecnologia della Pesca of Ancona, in collaboration with FAO, evaluated the sardine biomass over an area of 6 000 square miles at 150 000 tons. This survey was repeated in 1977[3]. Over an area of 8 500 square miles a biomass of 450 000 tons was detected, which was estimated to consist of one-fifth anchovy and four-fifths sardine.

76. The same year, the Split Laboratory of Oceanography and Fisheries carried out a survey which detected mainly anchovies. The biomasses recorded were comparable to those deduced from the surveys of eggs and larvae.

1/ Piccinetti, C., S. Regner et M. Specchi, Estimation du stock d'anchois (Engraulis encrasicolus L.) de la haute et moyenne Adriatique. Invest.Pesq., Barc. (in press)

2/ Laboratorio di Tecnologia della Pesca, Ancona, and FAO, Report to the Government of Italy on a joint survey to assess the distribution and abundance of pelagic fish stocks in the northern Adriatic. Rome, FAO, Italian-Funds-in-Trust, FAO/ITA/TF:25 p.
1976

3/ Burczynski, J. and M. Azzali, Report to the Government of Italy on the quantative acoustic estimation of sardine stock and distribution in the northern Adriatic Sea. Rome, FAO, Italian Funds-in-Trust, FAO/ITA/TF3:53 p.
1977

77. There are reasons to think that pelagic fish catches in the Adriatic now exceed 100 000 tons, of which perhaps one-third are sardine and two-thirds anchovy. If these indications are correct, the stocks of anchovy and sardine could support a certain expansion of fishing. On the basis of the data available at present, however, it is difficult to say by how much catches could be increased. The Working Party recommended that the progressive development of pelagic fishery in the Adriatic be accompanied by an intensification of scientific research and of the collection of statistical data. It noted with satisfaction that different programmes for the collection of statistics and biological data have been launched in the region. It hoped that these programmes would be pursued and that the data available would be published and interpreted rapidly. In this connection, it recommended that a first analysis of the data collected be submitted at its next session and that this analysis be compared with the results drawn from the surveys of various kinds carried out by the different laboratories in the region.

Sub-area 37.5 - Ionian

Demersal fishing

- Available data

78. The Italian data broken down by species have been completed for the years 1975 and 1976 (Table 15). Data which would made it possible to evaluate the effort in 1976 are not available. For initial calculations it has been agreed to use the figure for 1975. During the last two years some fishermen have tended to escape statistical control owing to the new tax regulations. This fact is particularly important in the southern Tyrrhenian Sea, where fishing cooperatives are rare and each fisherman is often in direct touch with the fishmongers.

79. The Tunisian data have also been completed for the years 1975 and 1976 (Table 16); they are broken down by species and the fishing effort is always recorded in number of days at sea. For the years 1967-1970, these data on effort have been completed by data on the gross registered tonnage of the trawler fleet. Data on the gross registered tonnage of the Tunisian and Italian trawlers are now available, therefore, for the entire period 1967-1976.

80. New statistics on Greek demersal fishing (1966-1973) have been supplied (Table 16). The Greek data on yield for the years 1973 to 1976, however, were not communicated during the session; they will be sent later. Data on effort are completely lacking.

81. The Libyan data on yield for the years 1975 and 1976 are not available. The same applies to Malta, which has not supplied data for these two years.

- Data analysis

82. The Italian catches represent 75-80 percent of the catches made in sub-area 37.5 and cover a longer period than those of the other countries in the region. Unfortunately, the effort data for this country do not yet take into account possible changes in the activity of the fishing fleet. In order to improve the assessments given in the report of the Sixth Session (Section 3.5.1), the following procedure was used:

83. The data on catch, total effort and catch per unit of effort, expressed as a percentage, were calculated for 1975 and 1976 as at the Working Party's Sixth Session (Table 6, page 42 of the report). For the Greek catches, it was assumed that catches have remained constant since 1973, the last year for which specific statistics for this sector of the Greek coast are available. For the catches by Albania, Libya and Malta, the figures given in GFCM Statistical Bulletin No. 2 were used. These data are presented in Table 17. They were used in calculating the yield curves in Figure 11.

84. The Italian data on catch and effort - expressed in gross registered tonnage - for the period 1959-1976 were analysed separately. Given the predominance of the Italian fishery, the trend in catches per unit of effort as a function of the fishing effort for this country should reflect fairly well the overall trend for many stocks in sub-area 37.5.

85. In order to take into account the fact that part of the Italian fleet operates on the Tunisian continental shelf, the catch and effort data for Tunisia have been added to the catch and effort data for Italy for the period 1967-1976. It must be pointed out that the effort data for these two countries are expressed in gross registered tonnage. These catches per unit of effort have been related to the average fishing effort, over two consecutive years and over three consecutive years respectively (Figure 12).

- Results

86. The cpue/effort relationship (reduced major axis) in Figure 11 has a highly significant correlation ($P < 0.05$). According to the resulting parabolic curve, the fishing effort corresponding to the maximum yield was attained in 1973 and slightly exceeded in 1975 and 1976. The maximum sustained yield for this whole area under the present conditions of exploitation is about 85 000 tons. This yield was exceeded in 1976 (estimated yield 99 600 tons). This growth may be due partly to a change in the conditions of exploitation of various stocks present in the sub-area, since it cannot be explained by the increase in effort from 1975 to 1976. Moreover, if one takes as the basis the exponential model, the effort corresponding to the maximum yield would only just be attained. Whatever the model used, Figure 11 shows that there is no point in increasing the fishing effort unless its distribution can be changed so as to improve the productivity of the sub-area as a whole. It is not possible to be more precise on this point with the present data.

87. Analysis of the combined data of Tunisia and Italy (Figure 12) shows that there is a close correlation between the cpue and the fishing effort (highly significant correlation, $P < 0.05$). If the yield of the stocks follows a parabolic function and if the effort is to be averaged over two years, then the maximum sustained yield (72 500 tons) has been attained. But if the three other treatments of the data used conform more closely to the real evolution of the stocks considered, the maximum equilibrium yield (about 80 000 tons) has not yet been achieved.

88. Whichever model best represents the real state of the stocks, it can be concluded that there is no point in an overall increase in fishing effort unless this is to exploit stocks or fishing grounds hitherto relatively neglected. As in the case of the analysis of overall demersal fishing in sub-area 37.4 (paragraph 70), the higher values observed in 1976 suggest that a certain modification in the distribution of the fleets'activities may be taking place. It is important to check this possibility, already put forward for the Adriatic, the Tyrrhenian Sea and the Gulf of Lions. For this purpose it should be ascertained, as for the Gulf of Lions (Figure 7), whether the specific composition of the catches has changed recently in certain fishery(ies) and, if so, whether this change could be explained by the exploitation of new fishing grounds, the use of new kinds of nets or a change in the preferences shown for various species. The fact still remains, however, that in the main fisheries enlargement of the fleets, for example through the acquisition of new boats, is inadvisable until it has been possible to check whether the possibilities of expansion suggested above really exist.

89. In order to comply with the suggestions put forward in the report of the Working Party's previous session, a separate analysis has also been made of fishing in the South-Sicily and East-Tunisia sector. In addition, this study has been extended by considering separately the main species exploited by the fleets fishing in this sector of the Mediterranean. The species thus studied are hake, red mullet and shrimp.

90. The cpue and effort expressed in Tunisian units (days at sea on the one hand and registered tonnage x days at sea on the other) show highly significant correlations. The unit of fishing effort used takes into account changes in the average size of the boats and in the duration of their activities. The results of this analysis lead to more optimistic conclusions than those of the analysis of sub-area 37.5 as a whole. This difference might be attributable on the one hand to the exclusion from the analysis of boats from certain Italian ports which are traditional bases for coastal fishing, and on the other hand to an improvement in the measurement of the fishing effort, now based on more detailed

Tunisian data. However, it must be pointed out that this analysis is based on developments only in the Tunisian cpue. Should the abundance of the stocks which are little if at all exploited by the Tunisian boats have undergone a different change, the extrapolation to the whole of the sub-area of the conclusions of this analysis would not be completely sound. In the present state of knowledge, the conclusions given in paragraph 88 remain valid. The assessments per species are given in the report appearing in Annex 13.

91. It has been possible to break down by sub-area the official data on Greek fishery. Those relating to sub-area 37.5 remain stable up to 1969 and then decline from 1969 to 1973. This fall may be due to the greater difficulties encountered by the Greek vessels from that date in acceding to the fishing grounds along the African coasts.

Pelagic fishing

- Available data

92. The Italian data on catches (Table 15) have been completed for 1975 and 1976. They are broken down by species. The fishing effort is expressed in gross registered tonnage. The data on total catches per species and on fishing effort thus now cover the period 1959-1976. The fishing effort for 1976 is not yet known. For the time being it has been assumed to be the same as in 1975.

93. The Tunisian data (Table 18) on catches have been completed for 1975 and 1976. They are broken down by species. The fishing effort is expressed in number of trips. The data on total catch per species and on fishing effort now cover the period 1967-1976. However, it should be noted that, in collecting the Tunisian statistics, a clear distinction is not always made between sardine (Sardina pilchardus) and sardinella (Sardinella aurita).

94. With the exception of the Greek data appearing in Table 16, catch statistics for the other countries in sub-area 37.5 are not available.

- Data analysis

95. The Italian catches differ from the Tunisian catches in their species composition. Sardinella (Sardinella aurita), the main species fished by the Tunisian purse seiners of sub-area 37.5, does not appear in the Italian statistics, while sardine (Sardina pilchardus), heavily fished by the Italian purse seiners, is known as a species of less importance in eastern and southern Tunisia.

96. This difference in the composition of the pelagic fish stocks exploited by the Tunisian and Italian seiners prompted a distinction between the two fisheries in the analysis.

97. For the Italian data, a table showing total yield per species and the corresponding cpue has been drawn up. It can be seen at once, from the catches and the indices of abundance available, that there are short-term fluctuations not easily explicable as the effect of fishing on the stocks. Other factors would seem to have something to do with it. The activity of the seiners is not linked to visible abundance of the fish, but rather to fluctuations in the demand, which remains in general very low. During the last four years, there has even been a decrease in the number of seiners (in 1959, there were 197 seiners; in 1969 this figure fell to 146 and in 1976 to 126). However, it is interesting to note that, simultaneously with the entry into force of the EEC "market regulations", from the last months of 1977 on, there has been a distinct increase in the fishing effort on the pelagic stock. At the next sessions it will be interesting to ascertain whether this development continues and whether the catches are substantially modified as a result, with a consequent change in the prevailing level.

98. The Tunisian cpue, expressed as tons per trip, decline according to the total number of trips, in the usual way. But the decline is not regular: there are appreciable long-term fluctuations. The cpue of the two species, Sardinella aurita and Sardina pilchardus, which form part of the pelagic stock exploited, taken together, show the same trend as the cpue for the whole stock. The data given in Table 18 have been analysed; they show a significant correlation. The equilibrium yield curve obtained with a Schaefer model shows a maximum of about 14 000 tons for an effort of about 11 500 trips. If one uses an exponential model, the maximum yield assessed is not noticeably changed, but this maximum is obtained only for a much greater effort. In 1975 and 1976, effort appears to have lain within the range of the two estimates of effort corresponding to the maximum yield (Figure 13).

99. These results do not agree with those obtained by echo-sounding. The quantitative surveys carried out by INSTOP and the UNDP/FAO project[1/] led to an estimate of the maximum potential catch of more than 150 000 tons for the Tunisian coasts as a whole. It is not possible at the moment to decide in favour of one estimate or the other. But given the quality of the data used in preparing Figure 13 and taking into account the difficulties of measuring correctly the fishing effort in a pelagic fishery, it is possible that the real potential may be higher than the yield curves in Figure 13. In this connection, it has already been pointed out that the fishing effort was not distributed in proportion to the distribution of the concentrations as it emerged during acoustic surveys. This may already help to explain the difference existing between the two types of estimate.

100. In view of the difficulties in assessing pelagic stocks on the basis of fishery statistics, the Working Party recommended that the possibility be studied of carrying out another quantitative exploratory acoustic survey in the sector. Since the identity and distribution of the stocks throughout sub-area 37.5 are not well known, it would be useful for the survey to cover as large a sector as possible. This requirement could be met by implementation of a joint survey, for example by Italy and Tunisia.

101. The data available did not make it possible to reach any conclusions regarding the state and potentials of the stocks or concentrations of pelagic fish exploited by the other countries of sub-area 37.5.

Sub-area 37.6 - Aegean

102. The Greek research worker has started to break down by statistical sub-area (37.5 and 37.6) the Greek data on catch published in the National Statistical Bulletin. Owing to lack of time, he has not yet been able to complete this work for the whole period covered by the two GFCM Statistical Bulletins (1964/1976), but has promised to do so and to transmit the results to the GFCM Secretariat in the near future.

103. Owing to lack of new data, the Working Party was unable to add anything to the conclusions it reached at the previous session (see Section 3.6 of the report). It was concerned regarding the risk that the scarcity of data was causing the fisheries in this sub-area, and particularly the demersal fisheries, to run. It wished to draw the attention of the two countries bordering on the Aegean, Greece and Turkey, to this situation and recommended that a serious effort be made at the national level to implement rapidly the various recommendations made by the GFCM regarding the collection, processing and transmission of statistics on catch and fishing effort. It also reminded its members of the role they should play in this connection as promoters at the national level.

1/ Rijavec, L. and Gleblaoui, M. - in press - INSTOP Bulletin, Salammbô, Tunisia

Sub-area 37.7 - Levant

Total catches and catch composition

104. The data on demersal and pelagic catches and on total catches in sub-area 37.7 have been brought up to date and are presented in Table 19 for the years 1972-1976. Data for the previous years may be found in Table 8 of the report of the Sixth Session of the Working Party.

105. The data on demersal catches in the Gaza strip for 1975 and 1976 are distinctly higher than the estimated yield for this area in previous years. It is assumed that the catch data for this area include the yield from the Bardawil lagoon, which the Working Party had not previously taken into account. The Working Party recommended that the GFCM Secretariat clarify this point with the statistical services of the countries concerned.

Demersal fishing

106. Assuming that the yield from the Bardawil lagoon is about 2 000 tons per annum, a small decline in catches is apparent from the statistics available for the years 1975 and 1976.

Pelagic fishing

107. A significant drop has been observed in the Israeli sardinella catches, which in 1976 were only 300 tons compared to a more or less steady yield of over 1 000 tons per annum in previous years. A decline of the same kind appears in the data on the total catches of pelagic fish in the region. This is attributable essentially to the fall in Israeli sardinella fishing in 1976.

Total catches

108. Assuming that the Bardawil lagoon yielded 2 000 tons of demersal fish, the data available show that the total yield in 1976 decreased by 12 percent as compared to 1974. The reason for this drop is not clear. Owing to the lack of data on fishing effort, it is not possible, in general, to establish a relationship between yield and fishing effort.

Effects of the decrease in the discharge of the Nile

109. At the Sixth Session of the Working Party it was admitted that the reduction in the nutritive elements discharged into the Mediterranean by the waters of the Nile which resulted from the construction of the Aswan Dam in 1966, had led to a fall in Egypt's sardinella catches.

110. The report of that session also mentioned that there were various indications that the construction of the dam had had harmful effects on the demersal stocks in the waters off the mouth of the Nile. The recent data on Cypriot fishing in this sector (which cover catches and corresponding effort) contradict this observation: the cpue do not show any drop, but, on the contrary, a slight increase. This increase may be due to an increase in the efficiency of the fishing operations, not reflected in the measurement of effort (number of fishing days) used for the calculations. The Cypriot research worker has offered to re-do this analysis, incorporating into the measurements of effort the engine power of the vessels. It should be pointed out, however, that the Cypriot data represent only a very small part of all the fishing operations carried out over the shelf near the Nile delta (about 2 percent); this fact should not be forgotten when the data are examined.

Stock assessment

111. Hardly any progress has been made in stock assessment, owing partly to the absence of data on fishing effort for some of the main fisheries in the region, and partly to the overlapping of stocks and fishing areas visited by the various national fleets (essentially trawlers and small-scale fishing vessels). Attempts to compare cpue trends for trawl fishing and coastal (artisanal) fishing in Cyprus reveal somewhat different developments. There has been a decrease of 8 percent in cpue for trawl fishing during the years 1966-1976, while there has been an increase in the case of coastal fishing, doubtless attributable to the recent modernization of the fleet and the consequent improvement in the efficiency of the vessels. It is not possible to take these factors into account with the existing data. It is interesting to note, however, that during the period 1972-1976 a substantial intensification of fishing effort in the coastal waters to the South and West of Cyprus has led to an increase in catches, varying between 13 and 117 percent according to the bay, the average being 37 percent (in 1976). The yields per unit area of the continental shelf along the southern coast of Cyprus are now close to the yields observed in the Gulf of Famagusta before 1974, i.e. 1 800 kg/square mile, and are expected to remain at the same level in 1977. These recent yields agree with the figure of 0.5 tons/km^2 used by the Working Party at its Sixth Session in making assessments for the region. Higher yields may even be possible, at least locally.

Sub-area 37.8 - Black Sea

112. Assessment of the Black Sea stocks is still being hindered by the very serious obstacles already stressed in the reports of the previous sessions:

- the shortcomings of the Turkish fishery statistics
- the lack of Soviet participation.

113. However, some progress has been made in the break-down, by statistical divisions, of the Turkish catches. A practically complete series of catch statistics by species is now available for Turkey. Nevertheless, there are still serious doubts concerning the quality of the data. For some species, like Psetta maxima, the catch statistics set forth in a table at the time of the Sixth Session (Table 9 of the report) differ considerably from those published in the GFCM Statistical Bulletin. The Turkish participant has kindly offered to check his country's data and indicate to the Secretariat the most reliable data series which will then have to be used in the various GFCM documents.

114. It has also been pointed out that the statistics collection system used in Turkey cannot provide very accurate estimates of the quantities fished. Many of the variations observed from one year to another in the catch statistics for the main species may therefore be fictitious.

115. No data on effort - fishing power and activity - for all the Turkish fleets operating in the Black Sea are yet available. The Working Party could not but repeat the concern it had expressed in this connection at its previous sessions (see chapter 3.8 of the report of the Sixth Session). If the exploitation of certain stocks, like anchovy and horse mackerel, continues to develop without comparable progress being made in data collection, it will be impossible to monitor the effects of this exploitation and prevent any possible over-exploitation of the stocks. The Working Party recommended that in formulating fishery development plans, national authorities give this problem all the attention it deserves.

116. According to the fishery statistics available (Table 20), anchovy and horse mackerel catches increased in 1976 as compared to 1975, but without reaching the record figures observed several years earlier (see Table 9 of the report of the Sixth Session). With only these data it is impossible to tell, even approximately, what the present catches represent in relation to the maximum potentials.

117. On a smaller scale, sprat catches are increasing steadily, due principally to the development of this fishery by Bulgaria and the USSR. In Bulgaria, this species is now in the leading place for quantities landed. A study on the variability of this stock and of its recruitment is given in Annex 8.

118. A very solidly-based report on the state of the turbot stock off the Bulgarian coasts was presented to the Working Party. It appears as Annex 7. The study concludes that the stock is heavily overfished at present and that a reduction in the fishing rate should prove advantageous for this fishery. The report on the state of the Bulgarian stocks (Annex 6) also indicates, moreover, that the stock is impoverished at present, the 1974 and 1975 age groups having been greatly reduced owing to a marked decrease in the benthos in the north-western part of the Black Sea continental shelf caused by Exuviella cordata bloom and the subsequent eutrophisation.

119. To enable this stock to replenish itself, the Bulgarian Government has forbidden trawl fishing and has expressed the wish to see the Turkish Government associate itself with this action by imposing similar measures on its nationals who fish for turbot off the Bulgarian coasts. The Turkish participant indicated that he would draw his Government's attention to this problem.

120. In addition, as it has not had time to analyse the Bulgarian document in detail and considering it necessary to collect all the data available on Turkish fishery, the Working Party recommended that the Turkish catch statistics be checked as soon as feasible, if possible isolating those coming from the western part of the Black Sea from those of the Turkish sector. The Working Party recommended that an ad hoc assessment meeting, in which Bulgarian and Turkish research workers as well as the Technical Secretary of the Working Party would participate, be organized by the GFCM. The object of this meeting would be to coordinate the results of the Bulgarian and Turkish studies on the state of the turbot stock and to present joint views on the measures to be adopted for its management.

IV - CONTROL OF THE LEVEL OF EXPLOITATION

121. In presenting this item on the agenda, Mr. A. Demetropoulos pointed out that, taken as a whole and bearing in mind the imprecision of the data available, the conclusions of the evaluations presented in the preceding part of the report agreed with those reached at previous sessions. Many demersal stocks appear to be fully or excessively exploited. This is the case along the European coasts, where, unless and until there is an appreciable improvement in the distribution of the fishing effort between the various exploitable stocks, no sizable increase in yield can be expected from an increase in the fishing effort. On the contrary, a decrease in effort would be of benefit in many cases, at least from the economic point of view. Other stocks in other sectors - for example, the turbot stock in the Black Sea - are also in the same state.

122. The Chairman invited the Working Party to discuss this item on the agenda by considering in turn: a) the urgency of the matter, b) the steps taken at national level in this field, and c) the role and the actions that could be taken by the Working Party to contribute to national efforts.

123. The information supplied by the participants on the actions taken by their respective countries are summarized in Table 21. This information and the additional comments supplied by the participants show that several countries have become aware of the urgency of the problem. Spain and France - countries in which, together with Greece, Italy and Yugoslavia, the situation is at the moment most serious - have taken steps aimed at limiting the number and engine power of their trawlers to the level which their fleets had at the beginning of the present decade. For this purpose, the licensing systems which already existed, but essentially for registration and administration purposes, are now used to control changes in the size of the fleets. This has given the administrations a way of intervening and has

had the effect of slowing down expansion of the fleets. But it has not always succeeded in keeping the catch capacity of the fleets below the desired level, the fishermen always succeeding in increasing the efficiency of their vessels while remaining within the prescribed regulations.

124. Other countries, such as Italy, Greece, Tunisia and Yugoslavia, are also aware of the problem and of the very great difficulties it presents, and have also started to take action, but in an indirect way, playing on credit facilities for construction. These countries, which a short time ago had plans for encouraging and subsidizing boatbuilding, have now changed over to a neutral, even restrictive policy.

125. In the discussions on the urgency of the problem, it was pointed out that this did not apply only to demersal stocks. In the Adriatic, despite the fact that the pelagic stocks would seem to be able to support an appreciable increase in exploitation, one may fear the consequences of the application of a marketing regulation mechanism adopted by the EEC (regulation 100/76) which, if wrongly applied, could lead to an extremely rapid increase in the fishing of anchovy, sardine and other pelagic species. Such an expansion could take place all the more rapidly in that the change from bottom trawl fishing to pelagic trawl fishing is easy and does not require new investments. Although such a transfer could not but be favourable to the more heavily exploited demersal stocks, it might also lead to a development of pelagic fishing in excess of the potentials and incompatible with the stage of progress so far reached in research work and in preparation of the scientific advice indispensable for the sound exploitation of this resource. The Working Party therefore recommended that the Committee on Resource Management and the governments concerned give urgent attention to this matter and that the latter see to it that they quickly acquire the means to enable them to control the changes in and the development of their pelagic as well as their demersal fisheries. It also recommended that plans for the development of pelagic fishing include provision for strengthening the facilities for data collection and analysis, which, despite recent progress, are still too inadequate to be able to provide administrations and industry with the advice they need.

126. Finally, the Working Party wished to emphasize that it did not consider that its role had been reduced by the fact that management measures had recently been taken or were about to be taken by several governments. It had been instrumental in propagating stock assessment techniques among the laboratories in the region, harmonizing national research efforts and directing them towards the study of problems directly connected with fisheries. Finally, it offered a structure able to supply, periodically or at the request of the GFCM Committee on Resource Management or member countries, qualified and impartial advice on the state of the stocks, in particular those exploited by more than one country. These requirements remain unchanged, as is shown by the special meetings it is planned to organize within the framework of the GFCM during the next inter-session period, which are described in paragraphs 120 and 157.

V - IMPROVEMENT OF STATISTICS

127. The assessments in Section III show that little substantial improvement in the nature of the data available has taken place since the previous sessions. Estimates are still based essentially on the application of overall models to not always complete catch statistics and to rough indices of fishing effort. Although this procedure has enabled the Working Party to calculate approximately the potentials and the state of exploitation of the large groups of stocks, it is insufficient when it is a question of specifying ways and means of ensuring better exploitation of the main stocks considered individually. The deficiencies underlined in previous reports of the Working Party (for example in Section 5 of the report of the Sixth Session) remain unchanged: absence of data on several factors directly affecting fishing effort, no distinction in the statistics between types of fisheries and absence of information on their location, precariousness of knowledge on the identity and distribution of the main stocks, ignorance of the dynamic parameters which enter into the analytical models, etc.

128. Several members did report progress, sometimes substantial, they had made in strengthening their laboratories' data collection programmes. But although these results are undeniable, such actions are still too isolated, not always being relayed and passed on at the national level by the structures and administrations concerned. This state of affairs cannot but delay awareness of the urgency of formulating measures designed to improve - or to ensure that there is no deterioration in - the state of the Mediterranean fisheries. The Working Party therefore wished to draw the attention of the Committee on Resource Management and national fishery administrations to the urgency of increasing the material and human resources which each country devotes to data collection and processing and of improving coordination between the various national services concerned.

Catches

129. A first version of the second issue of the GFCM Statistical Bulletin was used during the session. All participants were able to check the figures corresponding to their country's yield. The Greek, Tunisian and Turkish members were able to break down almost all their national catches by statistical sub-areas, or will be able to effect this break-down soon. It was decided that the national figures checked should reach the GFCM Secretariat before 1 April. The final version of the Bulletin will then be printed. For the first time all the Mediterranean catches will then be broken down by country, species and groups of species, and statistical sub-areas.

130. This does not mean that the statistics published in the Bulletin are all reliable. They are based on the figures given to FAO by the countries, if necessary complemented by information supplied by the members of the Working Party. The section on assessment indicates many examples of incorrect national statistics, resulting, for example, from non-registration of amounts which may represent more than half the total volume landed, or of poor identification of the main species. In at least two countries two different official services collect and publish statistics, in addition to those which may be assembled for their own needs by fishery research institutes. In this connection, the Working Party reminded its members of the role they should play in harmonizing and coordinating national statistical programmes.

131. In order to facilitate the transmission to FAO of national statistics conforming as closely as possible to the GFCM lists of species, the Working Party recommended that henceforward these lists be printed on the STATLANT 47A and B forms used for transmitting the statistics.

132. The Working Party then reviewed the progress achieved in each country. In several countries (France, Italy, Tunisia, Yugoslavia, etc.), processing of statistics, whether by the statistical services or in research laboratories, is tending to become automatized. The switchover to these new processing techniques has sometimes delayed the publication of statistics.

133. In Italy, where the problem of data collection is made particularly difficult by the fact that the landing points are scattered, the Ancona laboratory has submitted to the Government a project for collecting data by sampling and no longer by continual supervision of all the landing points. In a first stage the new scheme would be applied to six test districts for a period of one year. The results obtained would then be evaluated. The project proposes to obtain technical collaboration from FAO in defining the framework and the sampling plan (frame survey). The Working Party expressed great interest in this project. It hoped that it would be possible to adopt it in the near future and requested that it be kept informed of progress and results.

134. In Spain, following efforts by research institutes, data collection has improved in the ports bordering on the Alboran Sea and at Málaga.

135. In Yugoslavia, statistics are now collected according to a grid of statistical squares covering the whole Adriatic. This procedure should make possible better identification of the yield of the various stocks and a better estimate of effort.

136. In Tunisia, log-books are now distributed to all trawlers and purse seiners. This makes it possible to collect statistics on a daily basis, to know the location of the fishery and to collect much better information on effort. Statistics on artisanal (small-scale) fishing will be obtained by sample surveys, particularly as regards the species composition of the catches. All these data are processed in collaboration between the Fisheries Division and INSTOP.

Fishing effort

137. The Working Party recommended that the countries increase their efforts to collect better data on this parameter. It emphasized that the GFCM could make an appreciable contribution to increasing awareness of this problem by drawing the attention of the countries to the urgent need to have more correct estimates available on this essential parameter.

138. For this purpose it recommended that each year FAO request all the Mediterranean countries to declare their statistics of effort (initially on a yearly basis only). The STATLANT 47B forms should be used for this purpose. They should be forwarded to the national statistical services. A copy of this correspondence, to which should be attached a set of printed forms and copies of the special forms used by CECAF[1] for collecting the same data, should also be sent to the members of the Working Party to enable them to ensure that the best national statistics are sent to FAO.

Biological sampling

139. Several countries now have biological sampling programmes covering the main pelagic species - above all sardine and anchovy. As a general rule, the demersal species are still little monitored, since their sampling presents more difficulties, at least from the operational point of view.

140. Sampling programmes for the pelagic species have been developed above all in the Adriatic (Italy and Yugoslavia), in Tunisia and in the Alboran Sea ports (Spain and Morocco). A report on the development of the programme launched by the Ancona laboratory (Italy) was distributed. It is thought that the first analyses which these newly acquired data will make possible will be available for the next session.

VI - EXPLORATORY SURVEYS

141. The Working Party endeavoured to identify actions or initiatives likely to accelerate stock assessment work in the Mediterranean. Recognizing that research work will have to be based for a long time to come on the application of overall models - and that the correct estimation of fishing efforts, and hence of cpue, will remain the major obstacle to this procedure - it insisted on the need to promote survey programmes intended, by one technique or another, to assess the absolute or relative biomass of the stocks. Comparison between catches and the assessments of absolute biomass would make it possible to get a good idea of the rates of exploitation prevailing. These could be ascertained more precisely by monitoring over the years the changes in catches and biomasses (or their indices).

142. It was emphasized that assessments would always depend on knowledge of the catches and that measurement of effort would always be necessary, if only to transpose the assessments into regulations on the effort or capacity of the fleets. Consequently, the need to strengthen national statistical collection systems will not be made less urgent by the implementation of regular survey programmes.

1/ Fishery Committee for the Eastern Central Atlantic

143. The Working Party then reviewed the respective advantages and disadvantages, in the Mediterranean context, of the various methods for biomass surveying.

Trawl fishery surveying

144. The Secretariat submitted a work by J. Pope (Lowestoft, England) on the application of the Schaefer model to multi-species stocks. This work shows that in theory:

a) To the extent that each species which makes up the stock follows a Schaefer model in its exploitation, the same is true of the stock as a whole so long as the distribution of the total effort between the various species does not change for the various levels of exploitation considered

b) The height of the resulting Schaefer curve, and consequently its maximum, will be modified by the way in which the total fishing effort is distributed between the different elementary species

c) Comparison of the relatives changes in the indices of abundance for the various species - information which can be supplied by periodic surveys - can give an idea of the way in which the distribution of effort between the species or groups of species could be modified in order to obtain maximum overall yield for a given rate of exploitation.

145. These results are interesting in more than one respect:

a) They justify from the theoretical point of view the assessment procedures used by the Working Party for several years

b) They show that regular survey programmes can make a substantial contribution to the assessment - and indirectly the management - of the multi-species resources of the Mediterranean.

146. The information and time available did not make it possible to check whether national resources in vessels and research personnel were sufficient to be able to contemplate the generalization of long-term survey programmes. But the members of the Working Party undertook to see whether, bearing in mind the respective interest of the various types of research at sea and the programmes under way in their countries, the resources necessary for launching regular trawl surveys could be mobilized.

Acoustic surveys

147. The GFCM has for long recognized the usefulness of this technique in estimating fishery development and assessing pelagic stocks. The Mediterranean is, in fact, one of the regions in which these methods are or have been most widely used. The decision of the GFCM to set up a Working Party on Acoustic Methods for Fish Detection is intended to accelerate dissemination and application of these techniques.

148. Several participants emphasized the need for the Working Party to maintain close liaison with this new working party. Recognizing that the same was true for all types of surveying, it preferred to discuss questions of communication (see paragraphs 153-155) after completing its review of the various types of surveying.

Surveying of eggs and larvae

149. Dr. C. Piccinetti (Italy) gave a brief summary of the surveys of this kind organized in the Adriatic in collaboration between various Italian and Yugoslav laboratories. He took stock of the advantages and disadvantages of the method and pointed out that a great deal of research of this kind had been carried out or was under way in the Mediterranean. It would therefore be in the interests of the Working Party to improve its contacts with the

various national and regional structures which organize research work of this kind, so as to be able to indicate to them the stocks whose assessment is most important and to make full use of the results of their research. This measure would also make it possible to promote handling of the plankton samples already accumulated but not yet processed.

150. The Working Party approved this analysis. In order to be able to implement these conclusions, it requested Dr. Piccinetti to prepare a short summary giving:

a) An inventory (species, areas, laboratories) of the egg and larvae surveys carried out or under way in the Mediterranean

b) The results obtained (with bibliographic references)

c) The methodological problems (sampling, interpretation) and

d) Recommendations on the directions in which this kind of research should be oriented and the actions that could be taken by the Working Party to promote mutually efficacious collaboration.

151. This document will then be sent to the members of the Working Party through the GFCM Secretariat and, once finalized, distributed to the national and regional structures concerned in egg and larvae surveys.

Tagging

152. Finally, Dr. Piccinetti reminded the Working Party that tagging experiments could also supply biomass estimates. He stated that his laboratory was now carrying out such experiments in the Adriatic, in particular on sole. He would keep the Working Party informed of the results.

Liaison with the structures concerned in biomass surveying

153. The Working Party insisted on the necessity of establishing and maintaining close working relations between itself and the various national and regional structures concerned in surveying. This applies particularly, of course, although not exclusively, to its relations with the GFCM Working Party on Acoustic Methods for Fish Detection. The Working Party should be able to indicate to the various structures responsible for biomass surveying the stocks and geographic sectors of prior importance. It was also essential that the Working Party be kept regularly informed of the results of this research, so that it could compare them and include them in the periodic analyses it prepares of the state of the Mediterranean stocks.

154. The Working Party pointed out that its members were already responsible for assembling and communicating to it all the national research results which could help to improve knowledge of the potentials and the state of the Mediterranean stocks. This should be done through the preparation, before each of the Working Party's periodic sessions, of national research reports. These reports should contain the most recent fishery statistics (catches and efforts) and a summary of the results of the research work carried out in the national laboratories as a whole which could be of help in assessing the Mediterranean stocks. To these reports should be added scientific contributions giving the initial results of assessment work. These various documents would be published as annexes to the reports of the Working Party's sessions.

155. Finally, the Working Party drew up a table showing the stocks and the sectors for which it would like biomass surveys - mainly acoustic - to be carried out quickly.

Sector	Species	Objectives	Countries likely to carry out the surveys
Alboran Sea	a) Sardine b) Anchovy	a) Distribution of concentrations b) Assessment of biomasses	Spain, Morocco
Adriatic	a) Anchovy b) Sardine	a) Estimate of biomasses b) Distribution	Italy, Yugoslavia
Southern Sicily-Tunisia	a) Sardine b) Anchovy	a) Estimate of biomasses b) Distribution	Italy, Tunisia 1/
Greek coasts	Various pelagic species	a) Estimate of biomasses b) Distribution	Greece 1/
Turkish Black Sea coasts	a) Anchovy b) Horse mackerel	a) Estimate of biomasses b) Distribution	Turkey 1/

1/ These countries do not possess the full equipment necessary to carry out quantitative acoustic surveys; although it is not possible to specify at this stage who could carry out these surveys, these stocks and sectors are considered to have priority

VII - OTHER MEASURES WHICH COULD PROMOTE THE ACTIVITIES OF THE WORKING PARTY

156. In addition to the action recommended in the preceding sections of this report, the Working Party hoped that a second special working meeting would be organized under the aegis of GFCM during the forthcoming inter-session period. The first meeting is that regarding the assessment and management of turbot in the Black Sea, to be attended by Bulgarian and Turkish research workers as well as the Technical Secretary of the Working Party. The objective and interest of this meeting are analysed in paragraphs 118 to 120 of this report. The Working Party recommended that the GFCM Secretariat contact the Bulgarian and Turkish authorities in order to ensure their agreement and to fix with them the procedure for holding this special meeting.

157. The second meeting should deal with assessment of the fish resources of the Adriatic. These stocks have been the subject of various kinds of assessments (assessment by the Working Party, acoustic surveys, trawl surveys, surveys of eggs and larvae). A comprehensive summary should be made and on this basis the prospects for expansion of the various fisheries, their requirements as regards management and the research priorities should be formulated. Finally, the principles for better coordination of Italian and Yugoslav research work (collection, processing and distribution of biological statistics and data in particular) should be defined. The Working Party entrusted to Mr. S. Jukic (Yugoslavia) responsability for the organization and implementation of this meeting, in which Italian and Yugoslav, and possibly Greek, research workers should participate, as well as the Technical Secretary of the Working Party.

158. It was understood that the costs of organizing each of these two meetings would be borne by the laboratory issuing invitations and that the costs of participation would be borne by the bodies to which each participant belongs.

159. The Working Party expressed satisfaction at the visit made by Dr. M. Bouhlal (Tunisia) to the Ancona laboratory (Italy) to prepare, in collaboration with Dr. D. Levi (Italy), the statistics on Italian and Tunisian fisheries in the South Sicily sector. It thanked the GFCM for its contribution. It hoped that meetings of this kind to prepare statistics would become general practice among the research workers of the countries exploiting the same fishing sectors (Spain/Morocco/Algeria; France/Italy/Tunisia; Italy/Yugoslavia; Italy/Tunisia/Libya).

160. Finally, the Working Party recalled that the recruitment, even on a part-time basis, of a regional statistician still constituted a top priority on which the progress of assessment work in the Mediterranean depended. The task of this statistician would essentially be to visit periodically the statistical and research services of the member countries to advise them on how to improve their data collection and processing systems, and particularly on the full implementation of the Working Party's recommendations on statistics. In addition, he/she could organize one or two regional courses on the collection and processing of fishery statistics. The Working Party greatly regretted that the recruitment of this expert had so far to be postponed, owing to the impossibility of mobilizing the necessary funds. The Working Party requested the Secretariat to prepare a new draft budget and submit it to potential financial backers, in particular in certain member countries of the GFCM.

VIII - OTHER MATTERS

Fishing vessels and gear used in the Mediterranean

161. At its last session, the Working Party had recommended that the data collected by the GFCM during a survey of the fishing vessels and gear used in the Mediterranean be completed and published. Following this recommendation, the survey was completed and has given rise to the publication "Data on fishing vessels and gear in the Mediterranean" (P.Y. Dremière and C. Nédélec, 1977), No. 56 in the GFCM Studies and Reviews Series.

162. Although the data for certain countries are absent or incomplete, this publication gives a fairly faithful picture of the present characteristics of the production means used in the Mediterranean. It also brings out certain trends in the technical evolution that has occurred in recent years in various countries.

163. Such studies certainly deserve to be continued because, whatever the complementary methods of stock assessment adopted, they enable the Working Party to calculate more correctly the real efficiency of the fleets and the fishing power of the various gear used. This approach should facilitate interpretation of the nominal fishing statistics. The Working Party thanked and congratulated Mr. P.Y. Dremière for his contribution to the preparation of this document.

Presidence

164. Mr. A. Demetropoulos, the Chairman, pointed out that, although the GFCM rules are silent on this point, it seemed to him that there should be a periodic change in the person chairing the Working Party. This would, in particular, promote wider participation. Each chairperson, he added, could serve for two consecutive sessions, the next nomination taking place at the end of the present session in order to enable the new chairperson to take an active part in preparing the next two sessions, whose work he/she will have to conduct.

165. Mr. Demetropoulos having declined the offer of a new mandate, Dr. M. Bouhlal (Tunisia) was nominated Chairman. In the name of the Working Party he warmly congratulated Mr. Demetropoulos for the remarkable way in which he had guided and conducted the work of the Working Party's last two sessions.

IX - ADOPTION OF THE REPORT

166. The report was adopted by correspondence after the session.

TABLE 1 - Sub-area 37.1: Official catch data (t) - E = Spain; M = Morocco; A = Algeria
TABLEAU - Sous-zone 37.1: Données officielles des prises (t) - E = Espagne; M = Maroc; A = Algérie

	1974				1975				1976			
	E	M	A	Total	E	M	A	Total	E	M	A	Total
Sardine	35 032	14 325	20 197	69 554	12 759	10 260	25 665	48 684	(12 759)	15 651	21 069	49 479
Anchovy/Anchois	15 289	949	3 884	20 122	5 034	1 232	1 284	7 550	(5 034)	3 745	3 339	12 118
Total all coastal pelagic/Total tous pélagiques côtiers				94 794				60 101				66 133
Mullets/Rougets	3 398	123	854	4 375	1 563	76	847	2 486	(1 563)	182	783	2 528
Hake/Merlu	3 452	16	-	3 468	2 021	8	-	2 029	(2 021)	1	-	2 022
Poutassou	5 629	-	-	5 629	1 149	-	-	1 149	(1 149)	-	-	1 149
Total all demersal/ Total tous démersaux				46 002				24 616				26 647
Total all marine fish/ Total tous poissons marins	123 209	20 438	35 708	179 355				117 497				126 292

( ) Preliminary estimate/Première estimation

TABLE 2 - Sub-area 37.1: Spain - Average annual catches (in percentage of 1971) by main kinds of fishing 1/
TABLEAU - Sous-zone 37.1: Espagne - Prises moyennes annuelles (exprimées en pourcentage de 1971) par principaux modes de pêche 1/

	1971	1972	1973	1974	1975
Ring net/Filet tournant	100	103	96	119	139
Trawl/Chalut	100	86	86	98	100

1/ Source: Spanish "Comisión Permanente de Pesca del Mediterráneo"
Origine: "Comisión Permanente de Pesca del Mediterráneo" d'Espagne

TABLE 3 - Sub-area 37.1: Catch of Aristeus antennatus by continental Spanish boats in the Balearic zone and corresponding fishing capacity

TABLEAU 3 - Sous-zone 37.1: Prises d'Aristeus antennatus par les bateaux d'Espagne continentale dans le secteur des Baléares et moyens de capture estimés correspondants

Year/ Année	MALLORCA/MENORCA		ALICANTE		IBIZA	
	Catch/ Prises (t)	hp/ch 2/	Catch/ Prises	Effort (hp/ch)	Catch/ Prises 1/	cpue
1958	309	1 648				
1959	307	2 097				
1960	208	2 520				
1961	176	2 730				
1962	172	2 910				
1963	246	3 223				
1964	255	3 653				
1965	297	4 107				
1966	288	4 427				
1967	308	4 034				
1968	274	3 976				
1969	279	3 524				
1970	269	3 729	289	8 553	25.1	0.0367
1971	214	4 060	234	8 972	21.2	0.0284
1972	216	4 467	205.2	9 112	18	0.0245
1973	239	4 895	201	10 202	10.9	0.0208
1974	188	6 933	236	10 960	12.5	0.0227
1975	183	7 017	320.1	12 945	13.4	0.0258
1976	268	7 357	299.2	12 945	11.1	0.0240
1977			(359.9)	13 780		(0.0261)

1/ Landings at Ibiza/Débarquements à Ibiza

2/ Corrected to account for reduction in fishing time/Corrigé pour tenir compte de la diminution du temps de pêche

( ) Early estimate/Première estimation

TABLE 4 - Sub-area 37.1: Trends of Spanish fishing effort by main types of fishing

TABLEAU 4 - Sous-zone 37.1: Evolution de l'effort de pêche espagnol par principaux modes de pêche

	1971	1972	1973	1974	1975	1976
Trawl (1971 average)/Chalut (pourcentage 1971)						
hp x days/ch x jours	100	107	119	142	165	169
hp/ch	100	111	130	152	173	186
Ring net (1971 average)/ Senne tournante (pourcentage 1971)						
No. boats x days/N° de bateaux x jours	100	111	107	113	121	114
No. boats/N° de bateaux	100	97	98	96	97	90

Source: Spanish "Comisión Permanente de Pesca del Mediterráneo"/
Origine: "Comisión Permanente de Pesca del Mediterráneo" d'Espagne

TABLE 5 - Sub-area 37.1: Balearic - Data on catch (t), effort (No. of days at sea) and cpue on the purse seine fishery

TABLEAU 5 - Sous-zone 37.1:Baléares - Données de prises (t), d'effort (N° de jours de mer) et de cpue sur la pêche à la senne tournante

C = catch (t)/prises (t); E = No. of days at sea/N° de jours de mer;

cpue = catch per unit effort/prise par unité d'effort

Year/ Année	Málaga			Marbella, Estepona, Fuengirola			Motril			Adra			Almería			Baleares			Alicante				Al Hoceima			Year/ Année
	C	E	cpue	C	E	cpue	C	E	cpue	C	E	cpue	C	E	cpue	C	E	cpue	C	E	hp/ch	cpue	C	E	cpue	
1951																			2 859	696.9		4.1				1951
1952																			4 381	663.3		6.6				1952
1953																			4 867	651.6		7.5				1953
1954																			4 517	585.0		7.7				1954
1955																			2 303	610.5		3.8				1955
1956																			2 768	547.3		5.1				1956
1957																			3 744	598.4		6.3				1957
1958																			2 704	655.7		4.1				1958
1959																			2 461	744.3		3.3				1959
1960																			2 760	608.4		4.5				1960
1961																			2 584	606.4		4.3				1961
1962																			2 766	459.1		5.0				1962
1963																			2 633	637.1		4.1				1963
1964																			4 404	702.3		6.3				1964
1965																209	1 572	0.13	2 349	365.0		6.4	4 647	1 558	2.98	1965
1966																253	1 960	0.13	2 645	477.3		5.5	6 569	2 417	2.72	1966
1967																248	2 629	0.09					3 711	2 374	1.56	1967
1968																233	2 844	0.08					3 736	1 837	1.45	1968
1969																454	2 556	0.18					5 757	2 149	2.68	1969
1970	2 383						43.5						1 444			358	2 604	0.14	2 840		2 892	0.982	4 902	2 090	2.35	1970
1971	3 025						261			4 405			555	2 451	0.23	394	2 795	0.14	2 515		2 892	0.870	8 293	1 945	3.39	1971
1972	1 162						96			3 517			1 129	1 937	0.58	412	2 280	0.18	5 412		2 892	1.871	8 700	-	-	1972
1973	1 912						61.5			2 033			2 660	1 698	1.57	360	3 440	0.10	2 441		2 892	0.844	6 434	-	-	1973
1974	1 248						157.5			3 805			1 036	2 086	0.5	401	3 655	0.11	2 845		3 128	0.909	8 949	3 657	2.45	1974
1975	941	4 964	0.19		7 737			3 051								402	3 723	0.11	3 958		3 385	1.169	8 150	3 555	2.29	1975
1976	4 789	4 671	1.03		7 712			3 285											4 036		3 452	1.169	7 840	3 548	2.21	1976
1977	2 650	4 572	0.58		9 003			2 573													3 520		8 018	4 575	1.75	1977

TABLE 6 - Sub-area 37.1: Data on fishing effort for the fleets based at Al Hoceima (Morocco)

TABLEAU 6 - Sous-zone 37.1: Données sur l'effort de pêche des flottilles basées à Al Hoceima (Maroc)

	1974	1975	1976	1977
Purse seiners/Sardiniers				
Total No. of trips/N° total de sorties	3 657	3 555	3.548	4 575
Average gross tonnage/Tonnage moyen	44.7	47.6	45.03	49.29
Effort (GRT x No. trips/TJB x N° de sorties)	163 451	169 427	178 939	228 525
Trawlers/Chalutiers				
Total No. of trips/N° total de sorties	649	800	1 233	1 262
Average power/Puissance moyenne	125	116	174.7	158.64
Effort	74 920	101 104	169 909	202 815

TABLE 7 - Sub-area 37.1: Purse seine fishery of Al Hoceima (Morocco) - Catch and effort data
TABLEAU Sous-zone 37.1: Pêcherie à la senne d'Al Hoceima (Maroc) - Données de prise et d'effort

Year/Année	Sardine catch/ Prises sardine	No. of trips or days at sea/ N° de sorties ou jours de mer	Average total gross tonnage/ Jauge totale moyenne	No. of boats/ N° de bateaux	Total gross tonnage/ Jauge totale	Effort (average gross tonnage x No. of days at sea/Effort (jauge moyenne x N° de sorties)	c.p.u.e. (T/tx.p)
1964	4 367	-	27.6	21	580	-	-
1965	4 647	(1 558)	(28)	20	560	43 624	0.107
1966	6 569	(2 417)	(29)	21	609	70 093	0.094
1967	3 711	(2 374)	(33)	23	759	78 342	0.047
1968	3 736	(2 365)	(36.3)	21	762	85 850	0.044
1969	5 757	(2 149)	(37.4)	21	785	80 373	0.072
1970	4 902	(2 090)	(37.7)	17	641	78 793	0.062
1971	8 293	(2 720)	35.5	21	746	96 560	0.086
1972	8 700	-	35.1	22	772	-	-
1973	6 434	-	42.3	20	846	-	-
1974	8 949	3 657	47.7	21	939	163 451	0.055
1975	8 150	3 555	47.6	-	-	169 427	0.048
1976	7 840	3 548	45.0	-	-	178 939	0.044
1977	8 018	4 575	49.3	33	1 429	228 525	0.035

( ) Estimate/Estimation

TABLE 8 - Sub-area 37.2 (Gulf of Lions): Main catch and effort data
TABLEAU 8 - Sous-zone 37.2 (golfe du Lion): Principales données de prise et d'effort

	1974[1/]	1975	1976
Demersal fisheries/Pêcheries démersales			
1. Whole sub-area/Ensemble sous-zone			
• Total catches/Prises totales (t)	10 406	11 913	11 763
• Corresponding total engine power (hp)/Puissance motrice totale correspondante (ch)	79 811	85 208	91 133
2. Districts of/Quartiers de: Port-Vendres, Sète, Martigues, Marseille			
• Trawl catches/Prises au chalut (t)	7 500	8 950	8 650
• Corresponding total engine power (hp)/Puissance motrice totale correspondante (ch)	36 002	37 727	41 231
Pelagic fisheries/Pêcheries pélagiques			
1. Whole sub-area/Ensemble sous-zone			
• Catches/Prises (t) - sardine	11 313	15 485	11 307
- anchovy/anchois + sprat	3 845	3 268	2 892
• Purse seiner total tonnage (GRT)/Jauge (TJB) totale des sardiniers	3 899	3 938	3 704
2. Districts of/Quartiers de Port-Vendres, Sète, Marseille			
• Number of common fishing days/Nombre de jours communs d'activité (a)	95	129	122
• Corrected number of boats/Nombre corrigé de bateaux (b)	121	122	118
• Total number of successful fishing days/Nombre total de jours de pêche positive	287	386	366
• Fishing effort/Effort de pêche (a x b)	11 358	15 868	14 260
• Corresponding catch/Prise correspondante (t)(c)	9 405	12 430	10 505
• c.p.u.e. (c/a x b)	828	783	737

1/ For previous years refer to Table 2, pp. 35-36, of the report of the 6th Session of the Working Party (note that the last line on p. 35 should be moved to p. 36 under the heading "Sectors of Port-Vendres, Sète, Marseille")

1/ Pour les années antérieures, se référer au tableau 2, pp. 39-40, du rapport de la 6ème Session du Groupe de travail (noter que la dernière ligne p. 39 doit être insérée p. 40, immédiatement sous le titre: "Quartiers de Port-Vendres, Sète et Marseille")

TABLE 9 - Sub-area 37.3 (Corsica), France: Catch and effort data
TABLEAU Sous-zone 37.3 (Corse), France: Données de capture et d'effort

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
CATCHES/PRISES																		
Demersal catch/Prises démersales (t)	523	532	631	658	691	720	719	685	921	820	835	850	699	684	888	987	1 157	1 083
Pelagic catch/Prises pélagiques (t) (sardine + anchovy + sprat + misc./sardine + anchois + sprat + div.)	269	263	252	113	58	62	22	107	72	88	30	33	17	104	78	122	255	88
Total all species/Total toutes espèces (t)	880	851	946	836	803	790	811	922	1 165	1 078	1 100	1 123	1 028	1 128	1 561	1 514	1 630	1 495
EFFORT																		
All bottom fishing boats/Tous navires démersaux																		
Number/Nombre	286	282	286	295	297	289	284	364	293	287	301	330	308	302*	299	301	333	374
Tonnage (GRT/TJB)	686	576	637	596	735	785	783	1 036	1 023	1 058	1 207	1 191	1 161	1 220*	1 286	1 322	1 489	1 500
Engine power/Puissance (hp/ch)	3 254	2 930	3 164	3 190	2 803	5 165	4 500	6 319	7 101	7 737	8 258	9 233	9 844	10 130*	11 415	11 685	13 120	13 829
Purse seiners/Sardiniers																		
Number/Nombre											7	7	7	7	9	10	11	2
Tonnage (GRT/TJB)											29	30	30	30	80	100	70	15
Engine power/Puissance (hp/ch)											250	250	220	250	580	700	790	150

* Corrected data/Données corrigées

TABLE 10 – Sub-area 37.3 (Sardinia), Italy: Annual catches and fishing fleet statistics
TABLEAU – Sous-zone 37.3 (Sardaigne), Italie: Prises annuelles et statistiques sur les flottilles de pêche

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Demersal – Total catch/ Prises totales (t)	36 276	36 646	41 345	38 312	37 069	44 429	51 673	50 619	39 892	38 765	42 928	44 110	45 433	47 198	43 872	42 829	56 104	55 706
Merluccius merluccius	2 960	2 879	3 787	3 311	2 606	2 795	3 028	3 350	3 057	2 956	3 126	3 253	3 451	3 788	3 322	3 943	4 452	6 127
Solea solea	614	589	861	1 030	1 119	1 818	3 510	1 614	859	559	1 073	1 082	932	939	802	770	790	633
Mullus barbatus	2 746	2 642	2 943	2 633	2 395	2 551	3 863	2 979	2 451	2 307	2 647	2 702	2 769	2 674	3 274	3 214	2 589	3 990
Pagellus erythrinus	666	625	709	839	972	1 582	1 549	1 693	538	411	691	781	687	593	605	549	542	551
Trachurus trachurus	2 293	3 337	2 928	2 668	2 078	2 452	2 501	2 857	2 294	2 480	2 315	2 347	2 426	2 520	2 118	1 754	1 665	1 740
Aristeus antennatus + Aristeomorpha foliacea	675	662	717	711	696	1 071	879	864	872	901	1 130	1 078	897	1 043	1 167	985	875	723
Parapenaeus longirostris + Penaeus kerathurus	655	643	765	660	786	903	907	834	763	834	909	921	929	1 082	1 494	1 698	1 776	1 523
Nephrops norvegicus	246	247	259	207	206	310	317	346	191	168	239	346	380	414	466	535	510	570
Pelagic – Total catch/ Prises totales (t)	26 678	28 160	34 361	31 898	31 906	27 197	31 727	36 313	36 527	41 069	43 918	49 046	44 153	41 753	44 781	44 102	39 802	42 623
Sardina pilchardus	14 366	13 777	17 815	13 546	14 365	14 157	13 648	14 745	12 304	15 255	16 146	19 864	22 320	15 988	16 492	18 383	17 845	13 895
Engraulis encrasicolus	8 661	9 953	11 320	13 023	12 636	7 513	13 119	15 823	17 812	18 577	20 356	22 338	16 197	20 219	22 313	21 012	16 020	23 751
Scomber scombrus	1 642	1 627	2 033	2 012	2 575	2 661	2 738	2 958	2 389	4 142	3 577	3 067	2 253	1 738	2 510	1 692	1 607	1 226
Fleet/Flottille																		
Trawlers/Chalutiers																		
Number/Nombre	624	613	596	599	608	620	633	642	648	653	655	692	699	703	699	690	681	(681)
Tonnage (GRT/TJB)	18 334	18 212	18 330	18.245	18 508	19 178	19 811	20 651	21 225	22 073	21 421	23 322	23 977	24 488	24 757	24 351	24 351	(24 351)
Seiners/Sardiniers																		
Number/Nombre	170	179	189	175	184	188	195	201	222	222	232	229	231	220	217	221	224	(224)
Tonnage (GRT/TJB)	2 762	3 011	3 290	3 154	3 490	3 751	3 913	4 066	4 746	4 886	5 357	5 448	5 846	5 582	5 928	6 408	7 137	(7 137)

TABLE 11 - Sub-area 37.3 (Sardinia) - Tunisian demersal fisheries: catch and effort data
TABLEAU - Sous-zone 37.3 (Sardaigne) - Pêcheries démersales tunisiennes: statistiques de prise et d'effort

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Trawl/Chalut												
• Catch/Prise (t)												
Mackerel/Maquereau	(9)	-	-	-	103	42	18	55	-	21	22	67
Hake/Merlu	305	-	198	289	295	268	274	543	362	497	278	368
Pandora/Pageot	50	-	109	115	76	45	50	98	86	91	115	126
Picarel	(6)	-	-	-	240	137	86	130	-	108	139	183
Red mullet/Rouget	139	-	250	277	249	191	209	249	328	227	218	126
Horse mackerel/Saurel	(46)	-	-	159	172	330	332	482	374	219	249	235
Rays and sharks/Raies et requins	(31)	-	-	-	131	106	97	142	-	155	196	188
Shrimps/Crevettes	10	-	36	8	9	4	11	15	13	14	34	16
Cephalopod(e)s	(32)	-	-	102	101	74	74	150	100	125	107	80
TOTAL	(906)	1 042	1 508	1 722	2 351	1 554	1 452	2 347	1 860	1 815	1 723	1 927
• Effort (Days at sea x GRT/Jours de mer x TJB)	Data not yet available/Données non encore disponibles											
Small scale/Petits métiers												
• Catch/Prise (t)	929	881	1 403	1 215	1 149	1 070	1 241	1 273	1 024	1 192	1 243	2 696

( ) Unreliable data/Données douteuses

TABLE
TABLEAU 12 - Sub-area 37.3 (Sardinia): Tunisian pelagic fishery: catch, effort and cpue data
Sous-zone 37.3 (Sardaigne): Pêche pélagique tunisienne: données de capture, d'effort et cpue

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Catches/Prises (t)												
Sardine	-	-	-	264	481	196	227	543	273	621	779	620
Sardinella/Sardinelle	-	-	-	18	26	7	18	-	63	269	222	146
Mackerel/Maquereau	-	-	-	77	172	48	16	159	108	235	188	167
Anchovy/Anchois	-	-	-	-	-	-	-	-	12	-	-	-
Horse mackerel/Saurel	-	-	-	61	441	225	187	104	125	87	78	52
Seabream/Pagre	-	-	-								-	86
Miscellaneous/Divers	-	-	-	104	72	148	77	113	144	45		101
TOTAL	288	356	1 000	598	1 200	636	608	918	725	1 400	1 587	1 210
Effort												
No. of trips/N° de sorties	-	-	5 751	5 287	5 158	6 490	7 218	8 295	10 685	16 157	10 394	9 183

TABLE 13 - Sub-area 37.4 (Adriatic): Main catch and effort data[1/]
TABLEAU - Sous-zone 37.4 (Adriatique): Principales données de prises et d'effort[1/]

	1974	1975	1976
Trawl catch/Prises au chalut (t)			
Italy/Italie	67 150	71 369	80 317
Yugoslavia/Yougoslavie	1 894	(2)	(2)
Total	69 044		
Tonnage (GRT) of Italian trawlers/Tonnage (TJB) des chalutiers italiens	43 221	(3) 43 500	(3) 44 000
Yugoslavian cooperative cpue (kg/fishing day)/cpue cooperatives yougoslaves (kg/jour de pêche)	157	(2)	(2)
Pelagic catches/Prises pélagiques (t)			
Italy/Italie	66 606	47 556	40 138
Yugoslavia/Yougoslavie	23 825	23 962	26 419
Total	90 431	71 518	66 557
Tonnage (GRT) of Italian vessels/Tonnage (TJB) des bateaux italiens	1 742	(4)	(4)

(1) The data for the years 1959-73 are presented in Table 4, page 39 of the Report of the sixth session/Les données pour les années 1959 à 1973 sont présentées dans le tableau 4, page 43 du rapport de la sixième session

(2) Data will be provided later/Les données seront fournies par la suite

(3) Provisicnal data; exact data will be provided later/Donnée provisoire; sera précisée par la suite

(4) These data cannot be related to catches any more (see text, par. 68)/Ces données ne peuvent plus être reliées à la prise (voir texte, par. 68)

TABLE 14 – Sub-area 37.4 (Adriatic), Italy: Annual catches and fishing fleet statistics
TABLEAU – Sous-zone 37.4 (Adriatique), Italie: Prises annuelles et statistiques sur les flottilles de pêche

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Demersal – Total catch/ Prises totales (t)	(43 296)	(42 959)	(45 171)	(41 885)	(41 889)	(44 916)	(51 353)	(56 734)	(57 177)	(56 469)	(56 023)	(54 074)	(58 183)	(70 252)	(70 146)	(67 150)	71 369	80 317
Sharks, rays/ Requins, raies	1 356	1 425	1 658	1 405	1 437	1 412	1 332	1 565	1 544	1 432	1 316	1 234	1 062	1 262	882	1 043		
Merluccius merluccius	2 149	2 077	2 136	1 803	1 776	1 648	2 019	2 185	2 149	1 966	1 949	1 758	1 668	2 189	1 620	2 367	2 645	3 063
Solea solea	1 976	2 171	2 726	3 111	2 527	1 551	1 664	1 867	2 041	2 237	1 563	1 615	1 358	1 484	1 525	1 687	1 575	1 929
Mullus barbatus	925	1 179	1 277	1 000	1 587	1 001	990	1 239	1 265	1 380	1 490	1 576	1 231	967	1 259	2 887	1 409	1 507
Pagellus erythrinus	261	183	219	165	177	144	231	356	371	365	329	327	193	396	190	147	195	232
Trachurus trachurus	1 302	1 962	2 027	1 497	1 448	1 023	997	1 164	1 379	1 857	1 460	1 327	1 720	2 099	2 593	2 815	2 414	2 276
Aristeus antennatus + 1/ Aristeomorpha foliacea	331	411	583	562	641	425	202	109	95	79	94	87	81	61	50	40	62	110
Parapenaeus longirostris + Penaeus kerathurus 1/	73	71	130	143	84	162	218	279	296	146	127	190	144	98	62	39	55	43
Nephrops norvegicus	1 239	1 293	1 154	835	894	861	1 417	1 429	1 575	1 493	1 291	949	1 011	1 053	973	671	741	972
Cephalopods	9 873	7 082	8 020	9 000	6 609	9 823	12 485	13 968	13 781	13 581	12 068	12 690	10 952	14 008	10 083	11 613		
Pelagic – Total catch/ Prises totales (t)	(25 889)	(23 800)	(39 873)	(28 116)	(30 759)	(34 289)	(36 850)	(30 733)	(30 197)	(29 888)	(31 480)	(42 108)	(42 158)	(46 593)	(49 635)	(66 606)	47 556	40 138
Sardina pilchardus	9 617	9 904	12 934	8 088	5 745	4 092	7 027	6 817	6 922	8 819	8 578	14 321	9 726	14 212	15 530	24 441	18 532	17 134
Engraulis encrasicolus	9 262	8 879	21 694	17 007	20 843	24 024	25 647	19 352	17 617	16 813	19 404	25 511	30 522	30 904	33 069	39 801	27 507	21 272
Scomber scombrus	6 590	4 665	4 172	2 456	3 510	5 819	3 811	4 074	5 108	3 679	2 486	1 326	795	372	159	363	249	478
Fleet/Flottille																		
Trawlers/Chalutiers																		
Number/Nombre	(1 240)	(1 276)	(1 319)	(1 318)	(1 315)	(1 291)	(1 268)	(1 289)	(1 242)	(1 254)	(1 281)	(1 286)	(1 303)	(1 291)	(1 298)	(1 304)	1 408	–
Tonnage (GRT/TJB)	(20 458)	(21 856)	(23 388)	(24 047)	(25 299)	(25 607)	(27 943)	(29 765)	(32 180)	(35 610)	(37 496)	(38 577)	(40 562)	(40 988)	(42 159)	(43 221)	39 725	–
Seiners/Sardiniers																		
Number/Nombre	(142)	(128)	(123)	(122)	(121)	(123)	(118)	(110)	(113)	(106)	(102)	(95)	(89)	(85)	(78)	(79)	88	–
Tonnage (GRT/TJB)	(2 825)	(2 241)	(2 199)	(2 231)	(2 296)	(2 386)	(2 334)	(2 248)	(2 362)	(2 256)	(2 175)	(2 048)	(1 906)	(1 811)	(1 712)	(1 748)	874	–

1/ Unreliable data/Données douteuses

TABLE
TABLEAU 15 - Sub-area 37.5 (Ionian), Italy: Annual catch and fishing fleet statistics
Sous-zone 37.5 (Ionienne), Italie: Prises annuelles et statistiques sur les flottilles de pêche

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Demersal - Total catch/ Prises totales (t)	42 182	43 849	44 828	42 878	45 925	48 997	55 176	61 954	64 491	60 028	57 593	59 195	59 207	65 416	63 555	68 428	71 950	74 682
Merluccius merluccius	3 645	3 945	4 139	3 797	4 378	4 264	5 264	5 785	5 660	5 790	5 808	5 305	5 777	6 727	6 584	7 263	7 233	6 972
Soles soles	269	246	262	350	324	293	505	741	424	349	294	275	290	490	434	468	368	467
Mullus barbatus	2 367	2 247	2 347	2 384	2 735	2 973	3 570	4 084	4 841	3 529	3 480	3 639	4 302	4 466	4 851	5 125	4 897	4 833
Pagellus erythrinus	393	446	547	505	719	726	769	862	704	732	726	699	725	916	890	998	1 044	1 077
Trachurus trachurus	3 291	4 365	4 355	3 411	3 013	3 870	3 346	4 150	3 311	2 748	2 765	3 581	3 881	3 065	3 907	3 830	3 739	3 616
Aristeus antennatus + Aristeomorpha foliacea	484	613	823	645	622	727	816	911	884	740	846	774	677	1 001	791	1 115	866	840
Parapenaeus longirostris + Penaeus kerathurus	1 462	1 579	1 755	1 642	1 586	1 695	2 173	2 227	2 348	2 757	2 640	3 830	3 035	3 351	4 431	5 545	5 884	5 361
Nephrops norvegicus	166	240	283	292	253	177	310	357	380	436	364	397	377	465	583	891	1 014	1 313
Pelagic - Total catch/ Prises totales (t)	34 101	29 582	28 311	18 228	25 314	25 300	30 698	33 079	30 243	31 000	27 232	29 746	24 758	25 634	23 502	25 981	20 887	22 652
Sardina pilchardus	16 814	15 045	13 764	8 181	10 993	9 907	12 149	13 554	10 647	12 195	10 333	11 111	11 246	10 371	10 427	9 991	7 972	10 445
Engraulis encrasicolus	7 340	6 037	6 596	4 441	5 551	5 388	7 113	8 182	8 245	5 859	5 119	7 125	6 011	8 398	7 293	9 592	7 517	7 113
Scomber scombrus	5 240	5 841	4 111	2 909	5 372	6 819	7 634	8 098	6 245	8 801	8 340	8 039	3 178	2 388	3 026	2 682	1 759	1 774
Fleet/Flottille																		
Trawlers/Chalutiers																		
Number/Nombre	678	705	713	707	704	719	749	787	860	904	959	988	997	1 008	1 021	1 037	1 092	(1 092)
Tonnage (GRT/TJB)	21 445	22 433	22 820	23 394	23 683	24 747	25 450	26 754	29 543	32 133	36 679	39 155	40 500	42 312	43 263	45 679	50 887	(50 887)
Seiners/Sardiniers																		
Number/Nombre	197	187	178	179	175	170	176	170	164	155	146	145	132	133	130	127	126	(126)
Tonnage (GRT/TJB)	3 673	3 412	3 221	3 368	3 501	3 483	3 703	3 714	3 683	3 492	3 342	3 237	3 200	3 031	2 951	2 828	2 800	(2 800)

TABLE 16 - Sub-area 37.5 (Ionian): Catch and effort statistics available on the Greek and Tunisian fisheries
TABLEAU - Sous-zone 37.5 (Ionienne): Statistiques de prises et d'effort disponibles sur les pêcheries grecque et tunisienne

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
TUNISIA/TUNISIE (trawl/chalut)											
Total catches/Prises totales (t)		5 996	5 406	6 845	5 533	5 556	5 337	5 811	5 566	5 399	7 270
Fleet tonnage (GRT)/Tonnage de la flottille (TJB)		3 364	2 947	3 169	3 044	4 743	5 713	6 515	7 824	9 787	10 786
Days at sea/Jours de mer		8 026	8 102	9 266	9 154	10 270	11 972	12 693	15 326	17 732	21 813
GREECE/GRECE											
Total trawl catches/Prises totales au chalut 1/	3 220	3 410	(3 300)	3 340	2 850	2 600	2 770	2 390	-	-	-
Pelagic catches/Prises pélagiques 2/	1 837	1 653	(1 465)	1 094	991	1 563	1 265	966	-	-	-

1/ Assuming that 80% of total demersal are caught by trawlers, and excluding miscellaneous/En admettant que les chalutiers capturent 80% des prises démersales totales et non compris les divers non identifiés

2/ Excluding miscellaneous/Non compris les divers

TABLE
TABLEAU 17 - Sub-area 37.5: Demersal fishery. Total catch (all species included) and total effort estimates
Sous-zone 37.5: Pêche démersale. Estimation des prises totales (toutes espèces confondues) et de l'effort total

Year/Année	Catch/Prises (t)		c.p.u.e./p.u.e. (%)			Total effort/ Effort total	Total effort (2 year average)/ Effort total (moyenne sur 2 ans)
	Italy + Tunisia/ Italie + Tunisie	Total 37.5	Italy/ Italie 2/	Tunisia/ Tunisie 3/	Italy + Tunisia/ Italie + Tunisie		
1960	46 018	(57 516) 1/	107	89	98	(587)	-
1961	47 102	(58 878) 1/	108	86	97	(607)	(597)
1962	45 064	(56 330) 1/	101	95	98	(575)	(591)
1963	50 126	(62 658) 1/	107	82	94,5	(663)	(619)
1964	52 182	(65 228) 1/	109	77	93	(701)	(682)
1965	59 177	74 506	119	117	118	631	666
1966	66 740	81 575	128	139	133,5	611	621
1967	70 509	85 676	120	139	129,5	662	637
1968	65 592	81 281	103	130	116,5	698	680
1969	63 417	87 903	86	108	97	906	802
1970	64 678	80 404	83	115	99	812	859
1971	64 591	80 370	80	95	87,5	919	866
1972	70 753	88 155	85	82	83,5	1 056	988
1973	69 261	86 961	81	82	81,5	1 067	1 062
1974	73 994	91 694	83	66	74,5	1 231	1 149
1975	77 349	94 938	75	55	65	1 461	1 346
1976	81 952	99 587	81	60	70,5	1 413	1 437

1/ Assuming Italian + Tunisian catches made up 80% of the sub-area total as for the period 1965/1976 during which total catches can be reasonably well estimated/En admettant que les prises italiennes et tunisiennes se sont élevées à 80% du total pour la sous-zone comme cela a été le cas pendant la période 1965/1976 pour laquelle les prises totales peuvent être raisonnablement bien estimées.

2/ Original data in tons/GRT; Données d'origine en tonnes/TJB

3/ Original data in tons/days at sea; Données d'origine en tonnes/jour de mer

TABLE 18 - Sub-area 37.5: Catch and effort statistics for the Tunisian purse seine fishery
TABLEAU - Sous-zone 37.5: Statistiques de capture et d'effort de la flottille tunisienne de sardiniers

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Catches/Prises (t)												
Sardine	-	-	-	1795	276	2435	3612	4235	4393	5279	5986	7507
Sardinella/Sardinelle	-	-	-	4010	6471	2420	3441	3232	3307	5170	2174	811
Mackerel/Maquereau	-	-	-	968	592	646	455	385	915	2288	1166	969
Anchovy/Anchois	-	-	-	27	20	63	117	177	168	-	229	138
Horse mackerel/Saurel	-	-	-	144	449	583	151	13	218	310	85	117
Bogue	-	-	-	-	-	-	-	-	-	-	62	11
Miscellaneous/Divers	-	-	-	261	571	706	129	354	896	590	-	2862
TOTAL	4771	9283	10937	7916	11599	7687	9037	8396	9897	14536	12038	12615
Effort												
Number of trips/Nombre de sorties				5287	5158	6490	7218	8295	10685	16157	10394	9183

TABLE 19 - Sub-area 7 (Levant): Annual catches (t) by main species (or species groups) and countries

TABLEAU 19 - Sous-zone 7 (Levant): Prises annuelles (t) par principales espèces (ou groupes d'espèces) et par pays

	1972	1973	1974	1975	1976
Total demersal/Total démersales					
Turkey/Turquie	(2 500)	(2 220)	2 736	2 570	1 882
Syria/Syrie	(400)	(400)	(400)	733	693
Lebanon/Liban	(1 170)	(1 625)	(1 625)	600	600
Israel/Israël	2 056	2 037	1 932	2 000	2 200
Gaza + Sinai/Gaza + Sinaï	480	532	693	2 861	2 405
Arab Rep. of Egypt/Rép. Arab. d'Egypte	8 284	8 656	5 567	4 685	6 093
Cyprus/Chypre	1 313	1 439	1 177	905	971
Total	16 303	16 909	14 130	14 354	14 844
Sardinella sp.					
Turkey/Turquie	-	-	-	-	-
Syria/Syrie	(150)	(150)	(150)	0	0
Lebanon/Liban	-	-	-	-	-
Israel/Israël	1 622	1 621	939	1 000	300
Gaza + Sinai/Gaza + Sinaï	2 073	1 605	1 213	1 725	1 630
Arab Rep. of Egypt/Rép. Arab. d'Egypte	1 402	599	800	645	695
Cyprus/Chypre	0	0	0	0	0
Total	5 247	3 975	3 102	3 370	2 625
Total pelagic/Total pélagiques					
Turkey/Turquie	300	98	(175)	357	180
Syria/Syrie	250	250	(250)	28	27
Lebanon/Liban	630	875	(875)	600	600
Israel/Israël	1 901	1 878	(1 384)	1 200	600
Gaza + Sinai/Gaza + Sinaï	2 551	1 838	1 331	1 725	1 630
Arab Rep. of Egypt/Rép. Arab. d'Egypte	1 928	1 285	1 157	659	735
Cyprus/Chypre	0	0	0	15	80
Total	7 560	6 224	5 172	4 353	3 782
Grand total/Total général					
Turkey/Turquie	(2 800)	2 318	2 911	2 927	2 062
Syria/Syrie	(650)	650	(650)	761	720
Lebanon/Liban	1 800	2 500	2 500	1 200	1 200
Israel/Israël	3 957	3 915	3 316	3 200	2 800
Gaza + Sinai/Gaza + Sinaï	3 031	2 370	2 024	4 586	4 035
Arab Rep. of Egypt/Rép. Arab. d'Egypte	10 312	9 941	6 724	5 344	6 828
Cyprus/Chypre	1 313	1 439	1 177	920	1 051
Total	23 863	23 133	19 302	18 938	18 696

( ) Estimates from sporadic data in the FAO Yearbook of Fishery Statistics/Estimations tirées de données sporadiques publiées dans l'Annuaire statistique des pêches de la FAO

TABLE 20 - Sub-area 37.8 (Black Sea): Annual catches (t) by main species (or species groups) and by countries

TABLEAU 20 - Sous-zone 37.8 (Mer Noire): Prises annuelles (t) par espèces (ou groupes d'espèces) principales et par pays

	1972	1973	1974	1975	1976
Engraulis encrasicolus					
Bulgaria/Bulgarie	156	264	41	15	72
Romania/Roumanie	3 230	1 421	855	592	2 749
Turkey/Turquie	70 401	90 104	188 228	59 000	79 515
U.S.S.R./U.R.S.S.	129 000	154 000	264 900	201 886	274 694
Total	202 787	245 789	454 024	261 493	357 030
Trachurus mediterraneus ponticus					
Bulgaria/Bulgarie	534	849	2 169	1 973	1 809
Romania/Roumanie	511	617	608	1 003	1 514
Turkey/Turquie	22 100	27 933	13 669	14 193	19 631
U.S.S.R./U.R.S.S.	22 100	10 800	3 000	4 330	18 329
Total	45 245	40 199	19 446	21 499	41 283
Sprattus sprattus					
Bulgaria/Bulgarie	2 962	3 383	4 468	5 565	7 199
Romania/Roumanie	2 262	2 201	1 245	731	1 610
Turkey/Turquie	-	-	-	-	-
U.S.S.R./U.R.S.S.	900	900	500	830	1 610
Total	6 124	6 484	6 213	7 126	10 419
Pomatomus saltator					
Bulgaria/Bulgarie	0	0	6	15	62
Romania/Roumanie	0	0	0	1	6
Turkey/Turquie	-	370	-	2 058	3 499
U.S.S.R./U.R.S.S.	0	0	0	7	11
Total	0	370	6	2 081	3 578
Scomber scombrus					
Bulgaria/Bulgarie	-	-	-	-	-
Romania/Roumanie	-	-	-	0	0
Turkey/Turquie	-	-	128	346	39
U.S.S.R./U.R.S.S.	100	0	-	-	-
Total	100	0	128	346	39
Sarda sarda					
Bulgaria/Bulgarie	-	28	15	0	40
Romania/Roumanie	-	-	-	0	0
Turkey/Turquie	-	4 169	5 124	2 650	2 668
U.S.S.R./U.R.S.S.	-	0	0	0	0
Total	-	4 197	5 139	2 650	2 708

Continued/à suivre

TABLE
TABLEAU 20 - Continued/Suite

	1972	1973	1974	1975	1976
Psetta maeotica					
Bulgaria/Bulgarie	175	249	312	204	217
Romania/Roumanie	70	118	29	-	-
Turkey/Turquie	-	3 983	-	-	1 188
U.S.S.R./U.R.S.S.	800	800	-	0	0
Total	1 045	5 150	341	204	1 405
Merlangius merlangus euxinus					
Bulgaria/Bulgarie	-	-	-	454	347
Romania/Roumanie	416	329	1 305	346	541
Turkey/Turquie	-	2 476	3 683	7 572	3 894
Total	416	2 805	4 988	8 026	4 782
Total pelagic/Total pélagiques					
Bulgaria/Bulgarie	3 652	4 524	6 699		
Romania/Roumanie	6 003	4 239	2 708		
Turkey/Turquie	...	123 798	108 162		
U.S.S.R./U.R.S.S.	152 100	165 700	268 800	207 511	294 986
Total	161 755	298 261	386 369		
Mullus barbatus					
Bulgaria/Bulgarie	-	-	-	-	-
Romania/Roumanie	4	47	-	0	0
Turkey/Turquie	-	1 197	785	836	349
U.S.S.R./U.R.S.S.	100	100	-	-	-
Total	104	1 344	785	836	349
Mullus surmuletus					
Bulgaria/Bulgarie	-	-	-	-	-
Romania/Roumanie	-	593	-	-	-
Turkey/Turquie	-	-	-	-	-
U.S.S.R./U.R.S.S.	-	-	-	-	-
Mullidae					
Bulgaria/Bulgarie	-	-	-	0	0
Romania/Roumanie	4	47	-	-	-
Turkey/Turquie	3 226	1 790	785	836	359
U.S.S.R./U.R.S.S.	100	100	-	-	-
Total	3 330	1 937	785	836	359

Continued/à suivre

TABLE
TABLEAU 20 - Continued/Suite

	1972	1973	1974	1975	1976
Total demersal/Total démersales					
Bulgaria/Bulgarie	175	249	312		
Romania/Roumanie	490	494	1 414		
Turkey/Turquie	-	8 249	4 468		
U.S.S.R./U.R.S.S.	900	900	-		
Total	1 565	9 892	6 194		
Alosa spp.					
Bulgaria/Bulgarie	4	52	225	46	67
Romania/Roumanie	605	846	2 879	2 951	1 062
Turkey/Turquie	-	505	-	-	-
U.S.S.R./U.R.S.S.	1 400	1 800	1 700	1 538	515
Total	2 009	3 203	4 804	4 535	1 644
Acipenseridae					
Bulgaria/Bulgarie	17	30	23	34	42
Romania/Roumanie	171	197	-	120	109
Turkey/Turquie	-	-	-	-	-
U.S.S.R./U.R.S.S.	800	1 000	1 000	1 078	1 355
Total	988	1 227	1 023	1 232	1 506
Total diadroms/Total diadromes					
Bulgaria/Bulgarie	21	82	248	80	109
Romania/Roumanie	105	1 702	3 239	3 071	1 171
Turkey/Turquie	-	505	-	-	223
U.S.S.R./U.R.S.S.	1 500	1 900	-	2 616	1 870
Total	1 626	4 189	3 487	5 767	3 373
Grand total/Total général					
Bulgaria/Bulgarie	3 848	4 855	7 259		
Romania/Roumanie	7 498	6 435	7 361		
Turkey/Turquie	-	132 552	212 630		
U.S.S.R./U.R.S.S.	154 500	168 500			
Total	165 846	312 342			

TABLE 21 - Measures taken during the recent years to control the trawl fishery[1]
TABLEAU - Mesures prises au cours des dernières années pour contrôler le niveau de la pêche au chalut[1]

	Bulgaria/ Bulgarie	Cyprus/ Chypre	Spain/Espagne	France	Greece/ Grèce	Italy/Italie	Morocco/Maroc	Tunisia/Tunisie	Turkey/Turquie	Yugoslavia/ Yougoslavie
1. Fleet size/Taille de la flottille										
- Trawler horsepower/ Puissance motrice des chalutiers		in preparation	none/aucune	400 hp/ch max. 16 metres min., p.p.	100 hp/ch max. 14 metres max.	none/aucune	none/aucune	350 hp/ch max.	none/aucune	channels: 100 hp max.; offshore: none/ canaux: 100 ch max.; au large: aucune
- Number of trawlers/ Nombre de chalutiers	0	12								
. direct measures/ mesures directes (licences)	(trawling prohibited in Black Sea/chalutage interdit en mer Noire)	(flexible)	fleet stopped increasing since 1975 (licences forfaited if boat absent for more than 6 months)/ effectif bloqué niveau 1975 (licences perdues si navire absent plus de 6 mois)	fleet stopped increasing since 1972/effectif bloqué niveau 1972	none/ aucune	none/aucune	no limitation but licences are necessary/aucune limitation mais licences nécessaires	fleet as in 1975; licences necessary/ effectif de 1975; licences nécessaires	no limitation but licences are necessary/aucune limitation mais licences nécessaires	none/aucune
. indirect measures (restriction of credit for construction)/mesures indirectes (restriction du crédit à la construction		yes/oui	no/non	yes (not important since fleet stopped increasing)/oui (peu important puisqu'effectif bloqué)		yes (loans given according to boats destroyed)/oui (prêts liés à la démolition de certains bateaux)	yes/oui	yes (credit presently stopped)/ oui (crédits bloqués actuellement	yes/oui	yes/oui
2. Limitation of fishing activities/Limitation des activités de pêche							no/non	yes/oui	no/non	no/non
- hours per day/heures par jour		no/non	16h/day;16h/jour	yes in some ports/ oui dans certains ports	no/non	voluntary restrictions in certain ports/restrictions volontaires dans certains ports	no/non	yes/oui	no/non	no/non
- days per week/jours par semaine		no/non	5 days/week; 5 jours/semaine	5 days/week in certain ports (voluntary restriction/ 5 jours/semaine dans certains ports (restriction volontaire)	no/non	voluntary restrictions in certain ports/restrictions volontaires dans certains ports	no/non	yes/oui	no/non	no/non

1/ Not including the closed seasons and areas. Information on these measures are given in 1) "Some Aspects of Fisheries Policy in the Mediterranean Region" (GFCM/EC/74/5) and in 2) "The Regulation of Fishing Effort in Member Countries" (GFCM/EC/74/6), documents prepared for the Symposium organized jointly with the 12th session of the GFCM/Ne considère pas les saisons ou aires interdites. On trouvera des renseignements sur ces mesures dans 1) "Quelques aspects des politiques halieutiques dans la région méditerranéenne" (GFCM/EC/74/5) et dans 2) "Réglementation de l'effort de pêche dans les états membres " (GFCM/EC/74/6), documents préparés pour le Symposium organisé en relation avec la 12ème session du CGPM

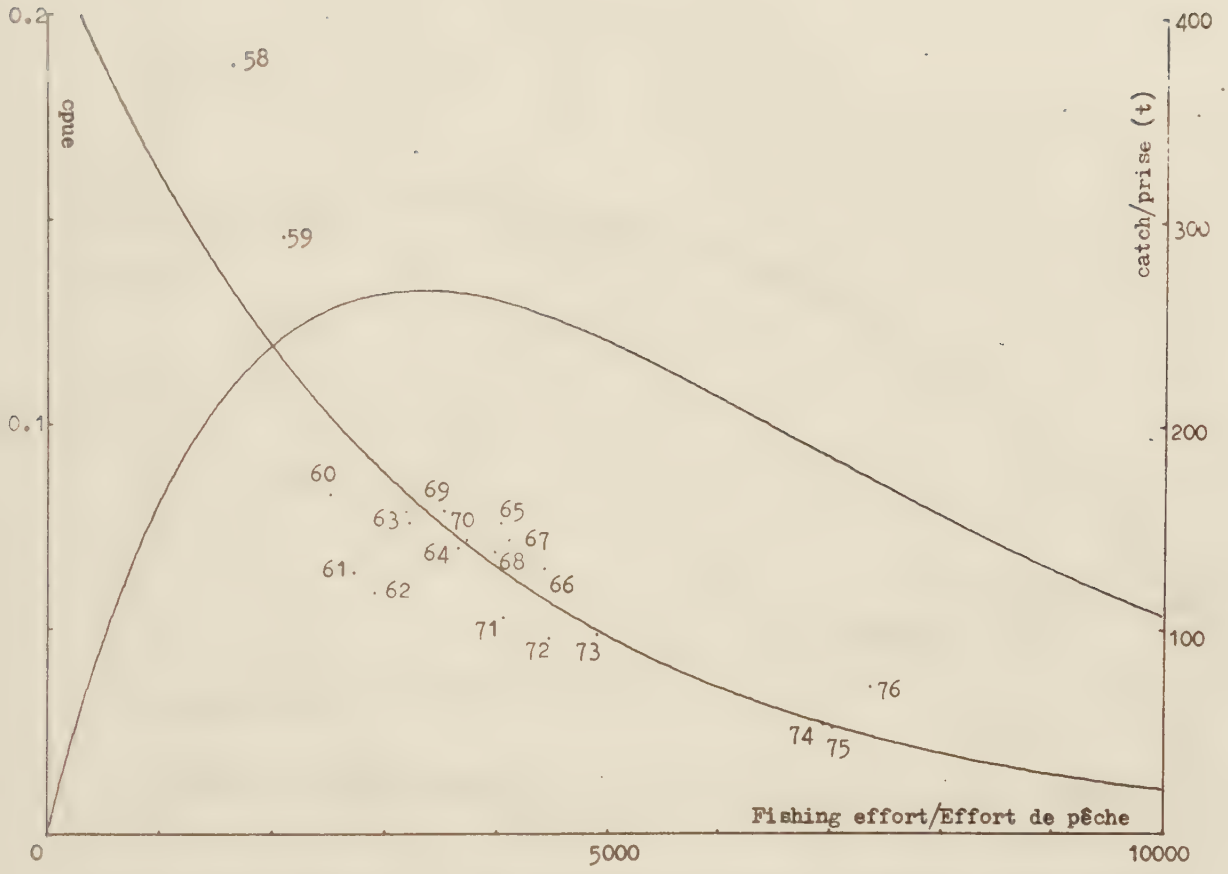

Figure 1 - Shrimp (Aristeus antennatus) fishery in Majorca: relationship between cpue and fishing effort exerted the same year and resulting yield curve (data from Table 3), exponential fitting: r = - 0.89

- Pêcherie de crevette (Aristeus antennatus) de Majorque: relation entre la cpue et l'effort de pêche exercé la même année et courbe de production correspondante (données du tableau 3), ajustement selon une fonction exponentielle, r = - 0,89

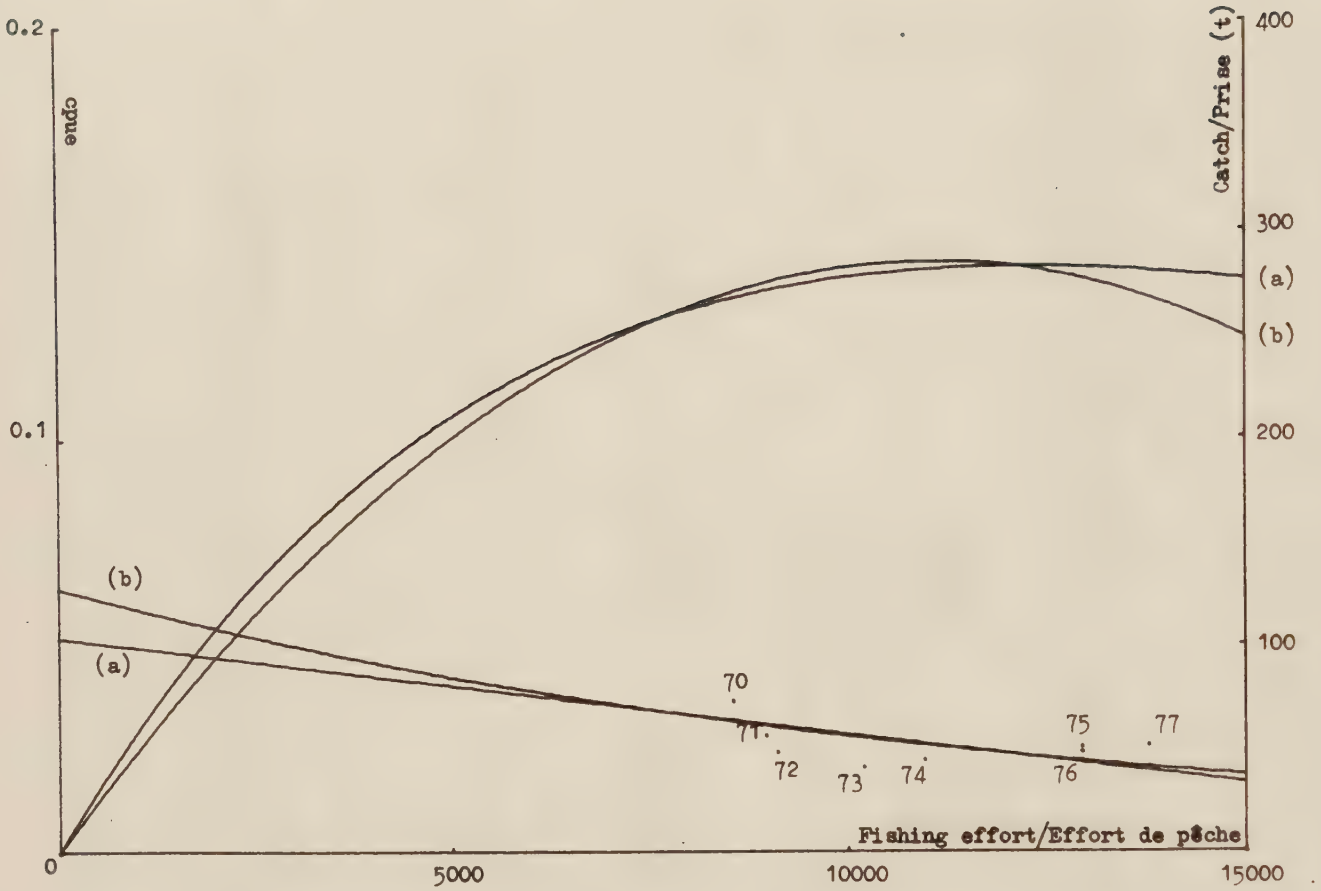

Figure 2 - Shrimp (Aristeus antennatus) fishery of Alicante and Ibiza: relationship between cpue and fishing effort exerted the same year and resulting yield curve (data from Table 3): (a) linear fitting: r = - 0.40; (b) exponential fitting: r = - 0.36

- Pêcherie de crevette (Aristeus antennatus) d'Alicante et Ibiza: relation entre la cpue et l'effort de pêche exercé la même année et courbe de production correspondante (données du tableau 3): (a) ajustement selon une fonction linéaire, r = - 0,40; (b) ajustement selon une fonction exponentielle, r = - 0,36

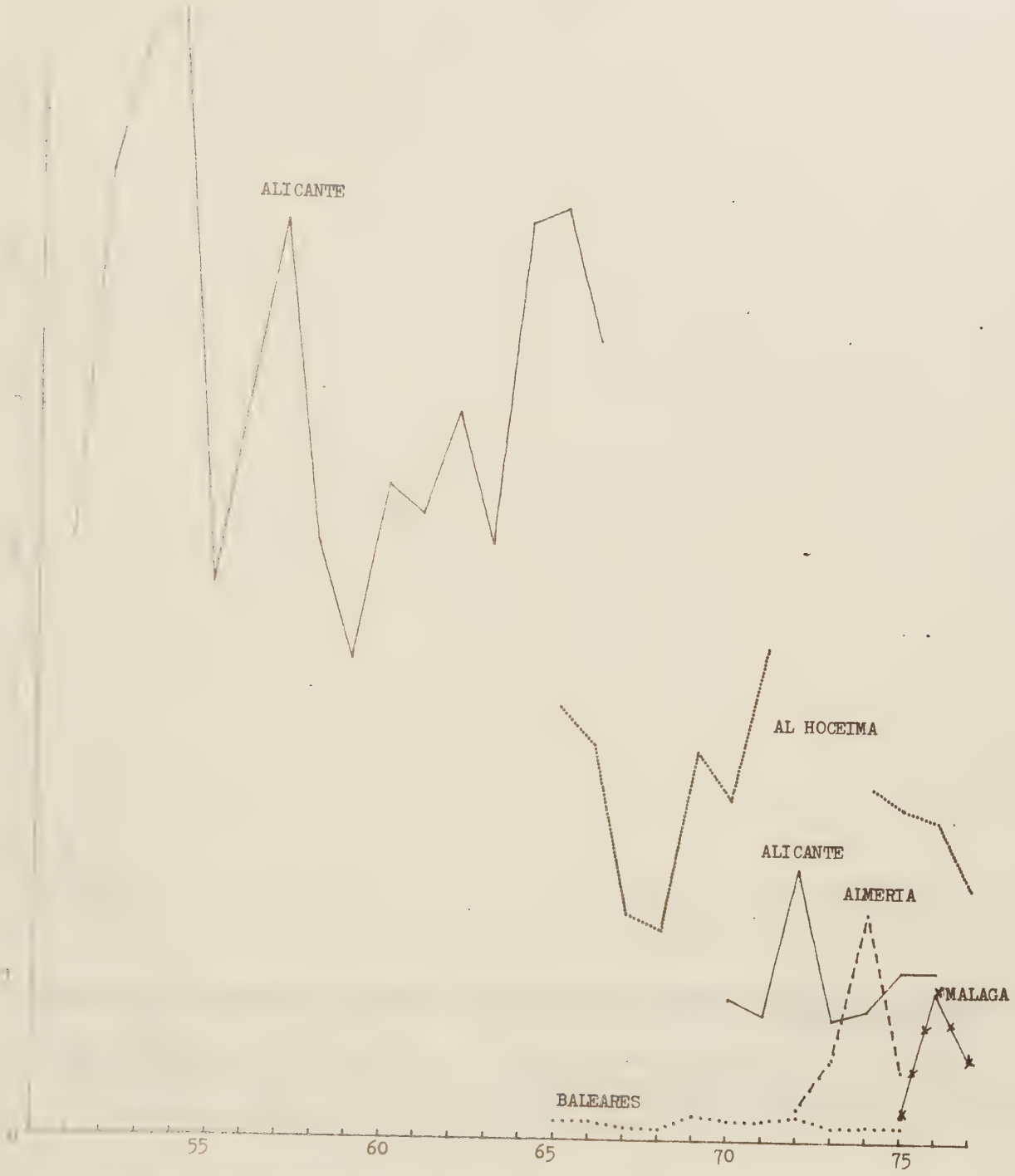

Figure 1 - Sub-area 37.1: Trends in cpue in several sardine fisheries (Al Hoceima, Almería, Málaga, Baleares) during the period 1964/77

- Sous-zone 37.1: Evolution comparée des cpue dans diverses pêcheries de sardine (Al Hoceima, Almería, Málaga et Baléares) au cours de la période 1964/77

Figure 4 - Sub-area 37.1: Recent (1976/77) increase of year class 0 in the landings of red mullets in Málaga (Spain)

Sous-zone 37.1: Augmentation récente (1976/77) des individus de la classe 0 dans les débarquements de rouget à Málaga (Espagne)

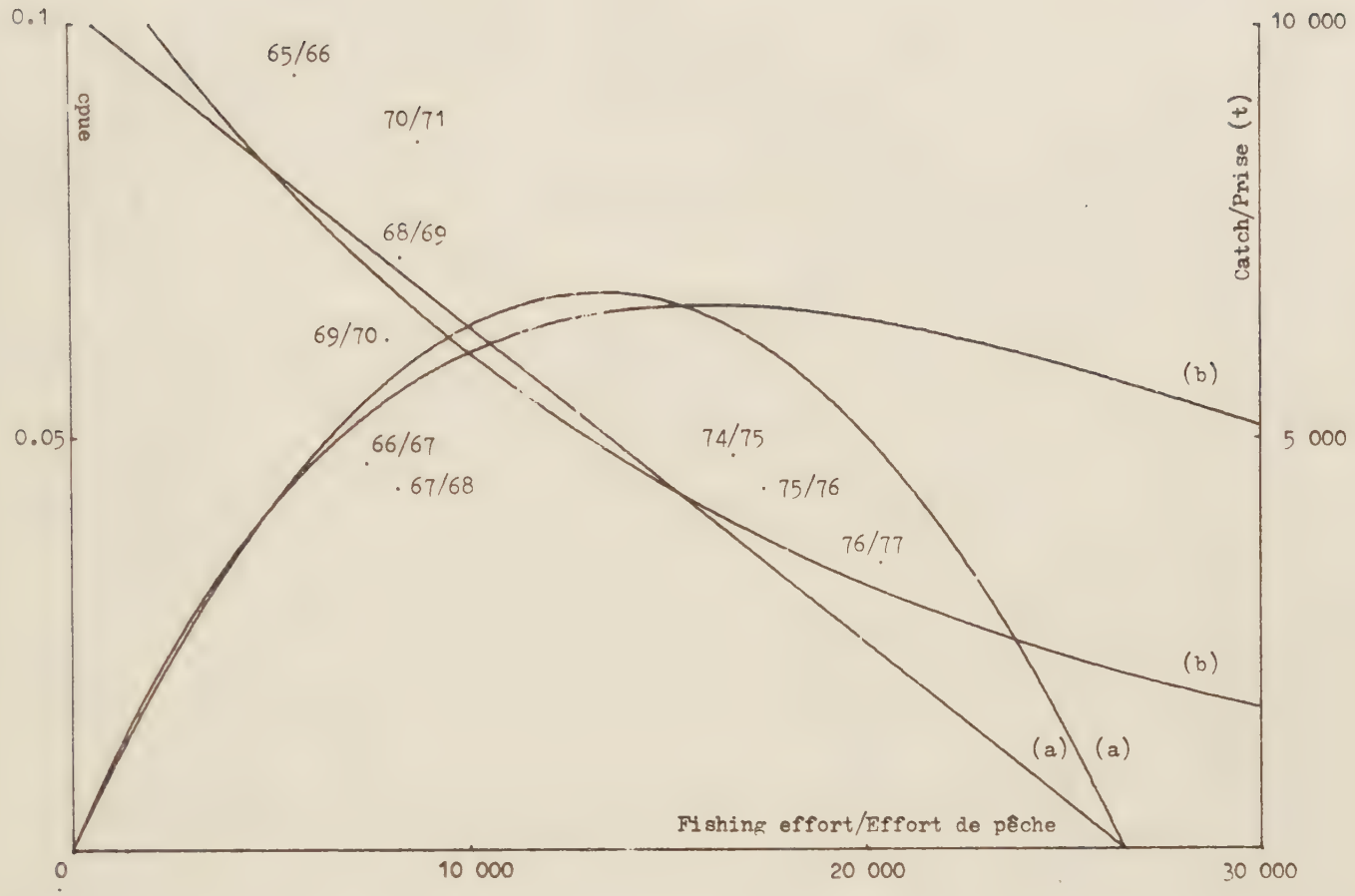

Figure 5 - Al Hoceima sardine fishery: relationship between cpue and fishing effort (2 years average) and resulting yield curve (data from Table 5): (a) linear fitting: r = - 0.66; (b) exponential fitting: r = - 0.70

- Pêcherie de sardine d'Al Hoceima: relation entre la cpue et l'effort de pêche (moyenne sur 2 ans) et courbe de production correspondante (données du tableau 5): (a) ajustement selon une fonction linéaire, r = - 0,66; (b) ajustement selon une fonction exponentielle, r = - 0,70

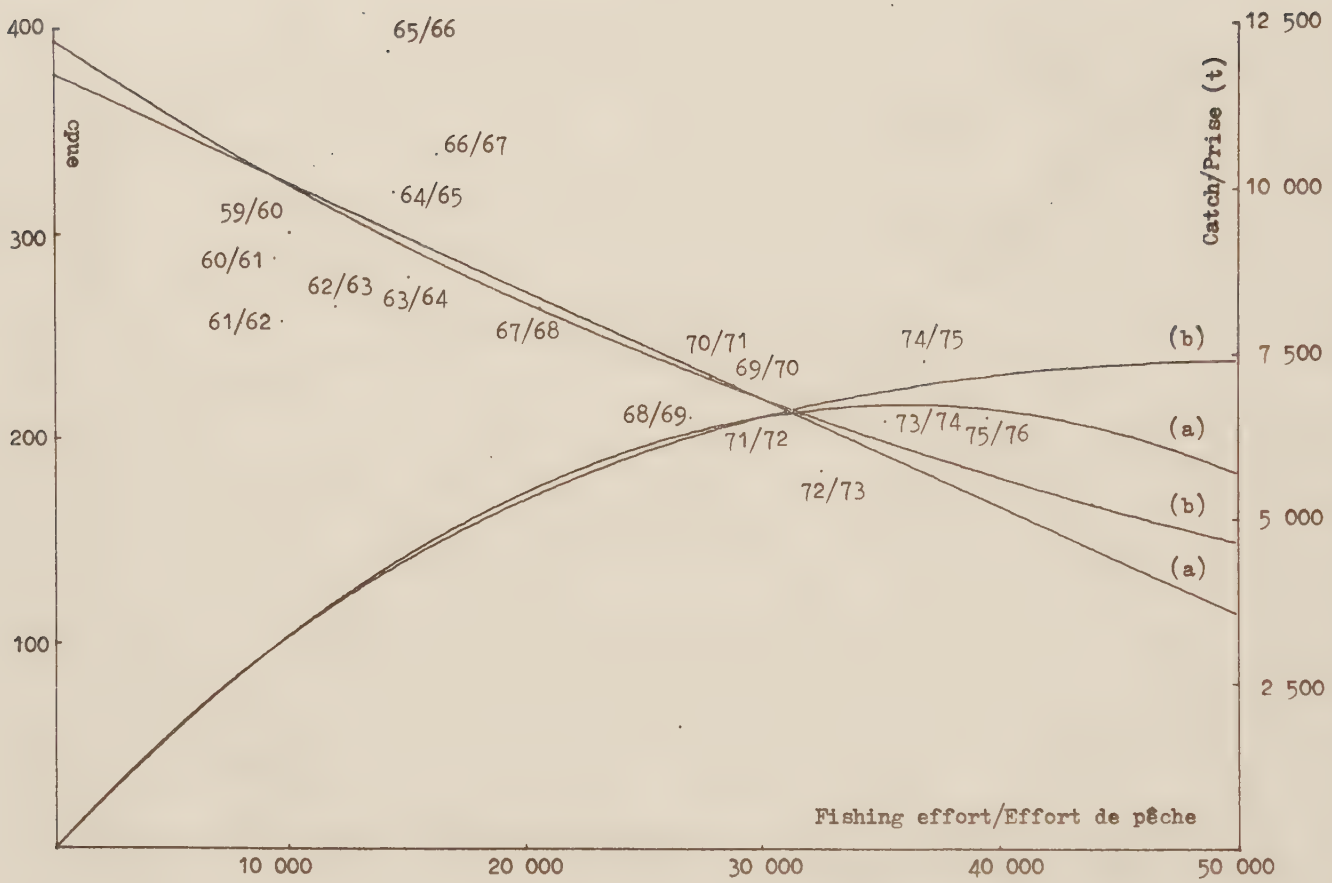

Figure 6 - Sub-area 37.2: Trawl fishery in the Gulf of Lions sensu stricto: relationship between cpue and fishing effort (2 years average) and resulting yield curve (data from Table 8): (a) linear fitting, (b) exponential fitting

- Sous-zone 37.2: Pêcherie au chalut dans le golfe du Lion sensu stricto: relation entre la cpue et l'effort de pêche (moyenne sur deux ans) et courbe de production résultante (données du tableau 8): (a) ajustement selon une fonction linéaire, (b) ajustement selon une fonction exponentielle

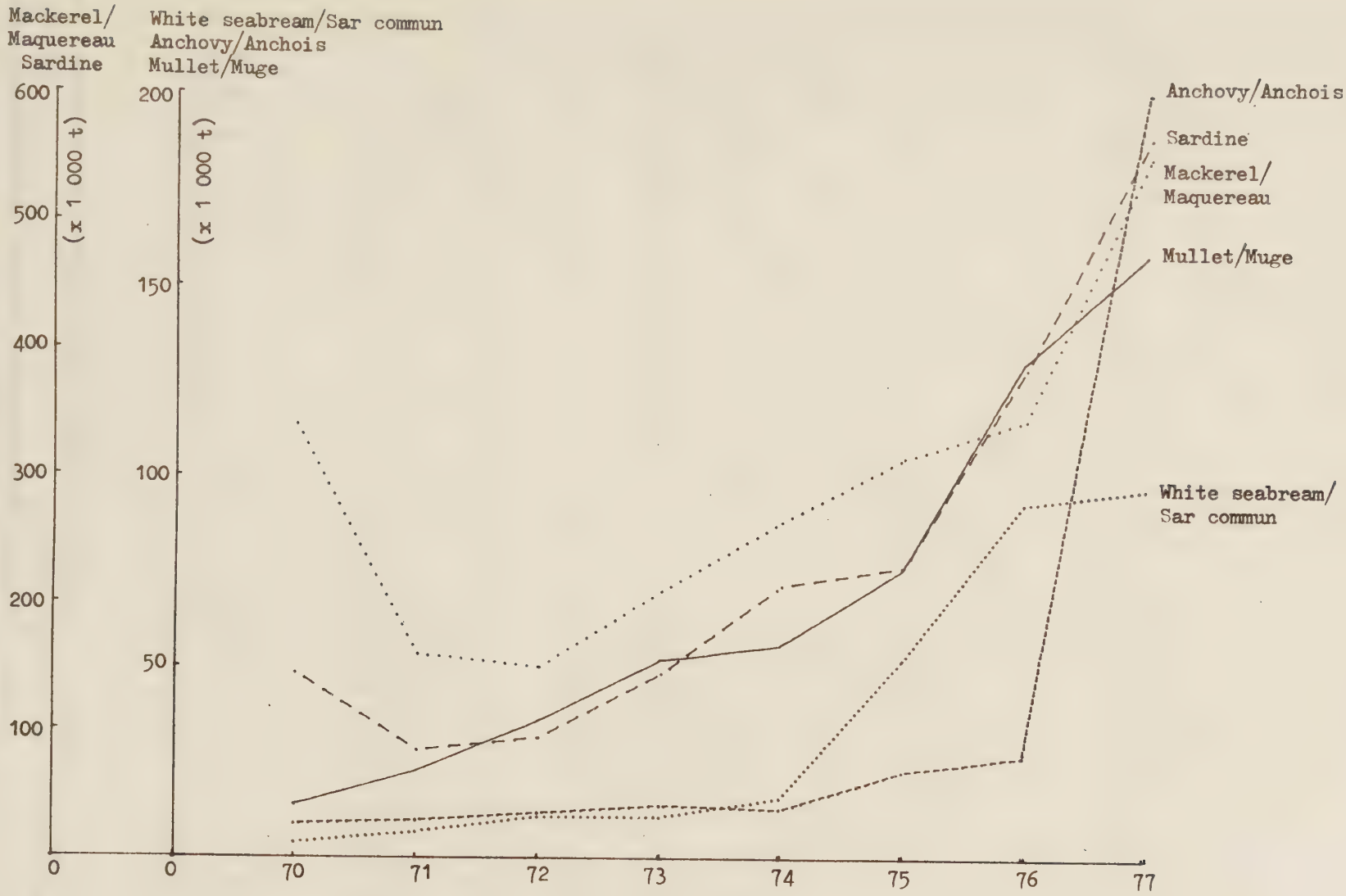

Figure 7 - Sub-area 37.2: Increased catches of pelagic species in the landings of trawlers at Sète (France)

- Sous-zone 37.2: Accroissement des captures d'espèces pélagiques dans les captures débarquées à Sète (France) par les chalutiers

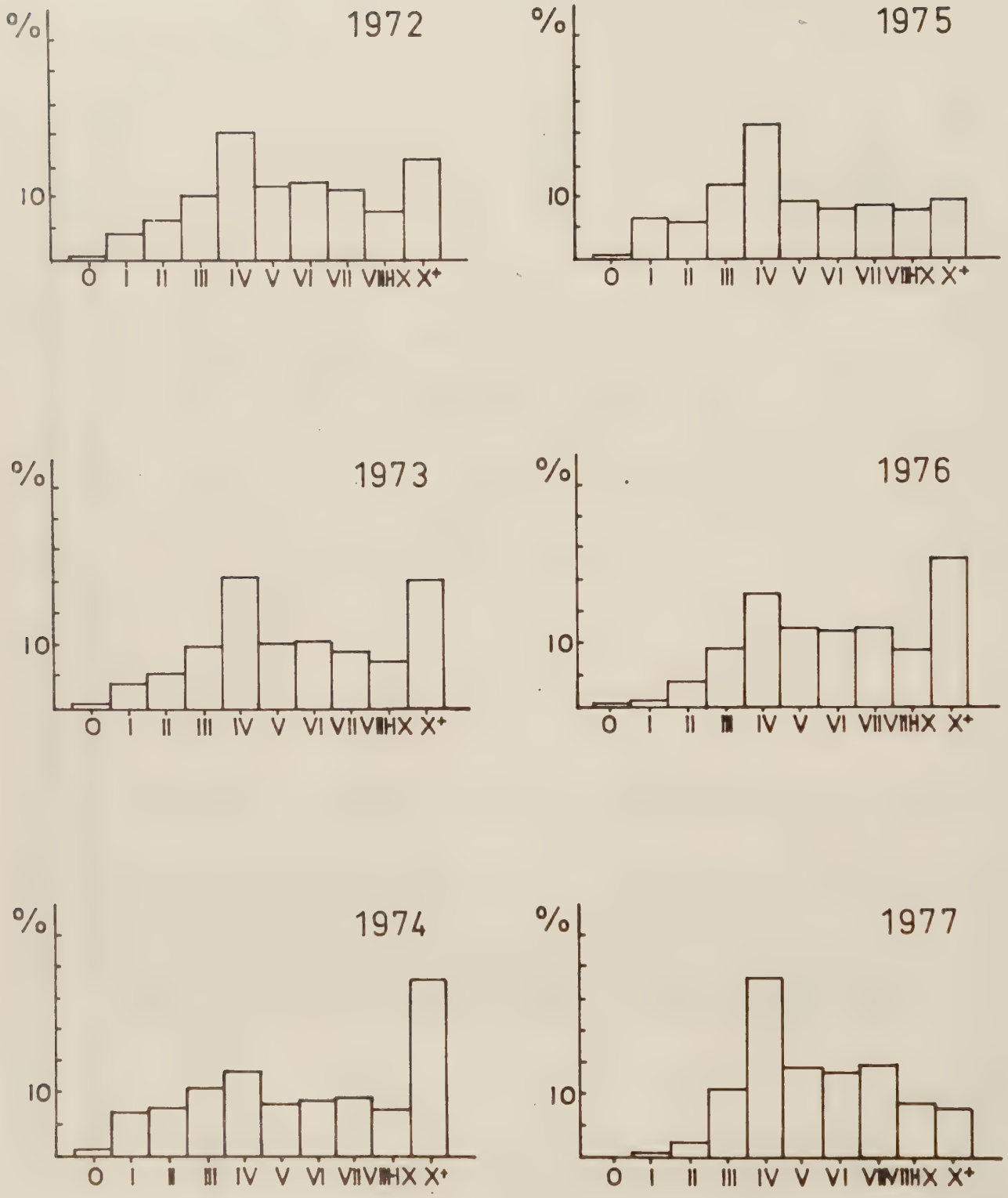

Figure 8 - Annual age composition of sardine landings in Port-Vendres, Sète and Marseille (after Pichot and Aldebert, 1978)

- Compositions annuelles d'âge des débarquements de sardine à Port-Vendres, Sète et Marseille (d'après Pichot et Aldebert, 1978)

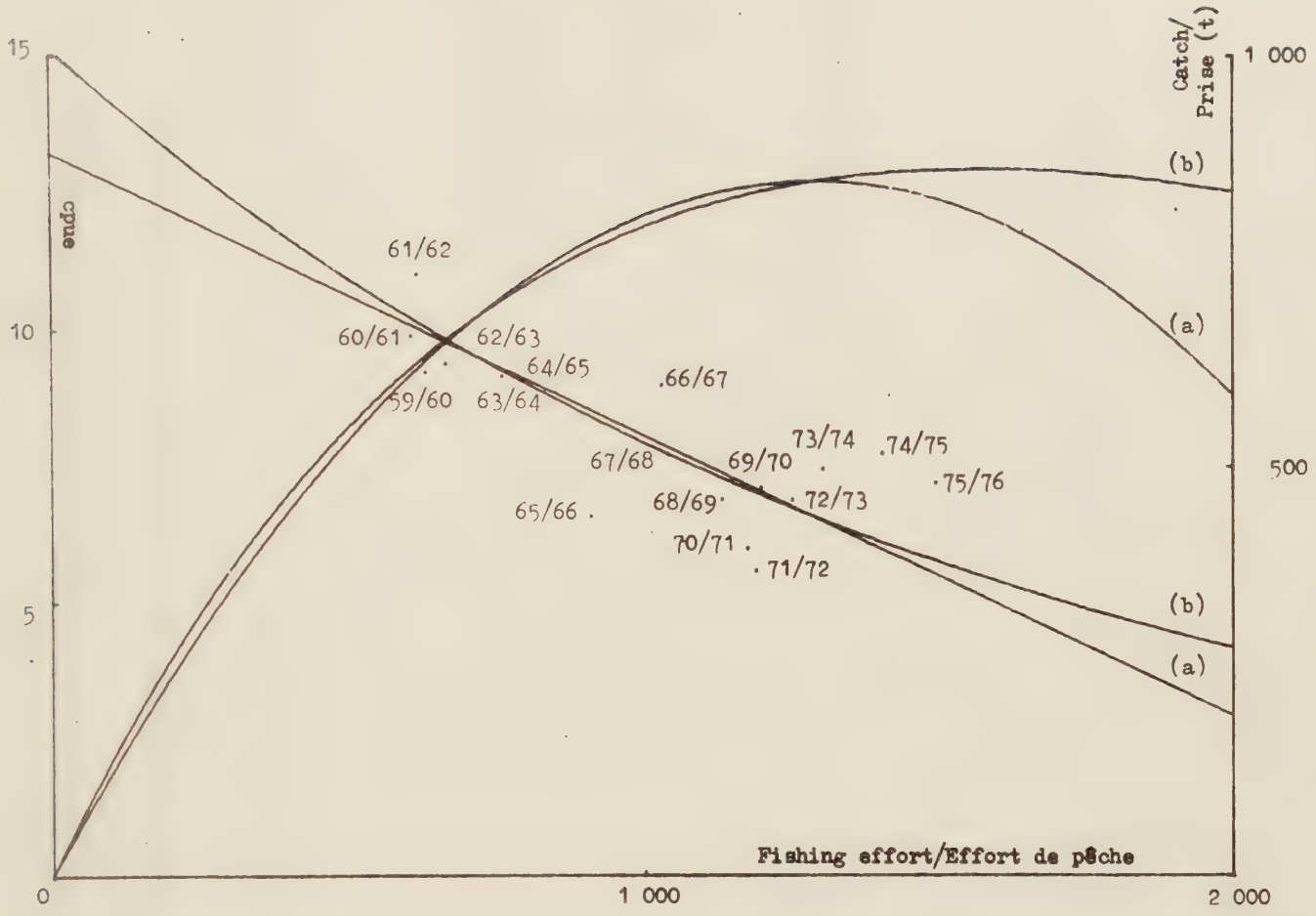

Figure 9 - Sub-area 37.3: Demersal (all species) fisheries in Corsica: relationship between cpue and fishing effort (2 years average) and resulting yield curve: (a) linear fitting, (b) exponential fitting

- Sous-zone 37.3: Pêches démersales (toutes espèces) corses: relation entre la cpue et l'effort de pêche (moyenne surdeux ans) et courbe de production correspondante: (a) ajustement sur une fonction linéaire, (b) ajustement sur une fonction exponentielle

Figure 10 - Sub-area 37.3: Trends in the cpue's of the French (Corsica), Italian and Tunisian purse seine fisheries

- Sous-zone 37.3: Evolution des cpue dans les pêcheries française (Corse), italienne et tunisienne à la senne tournante

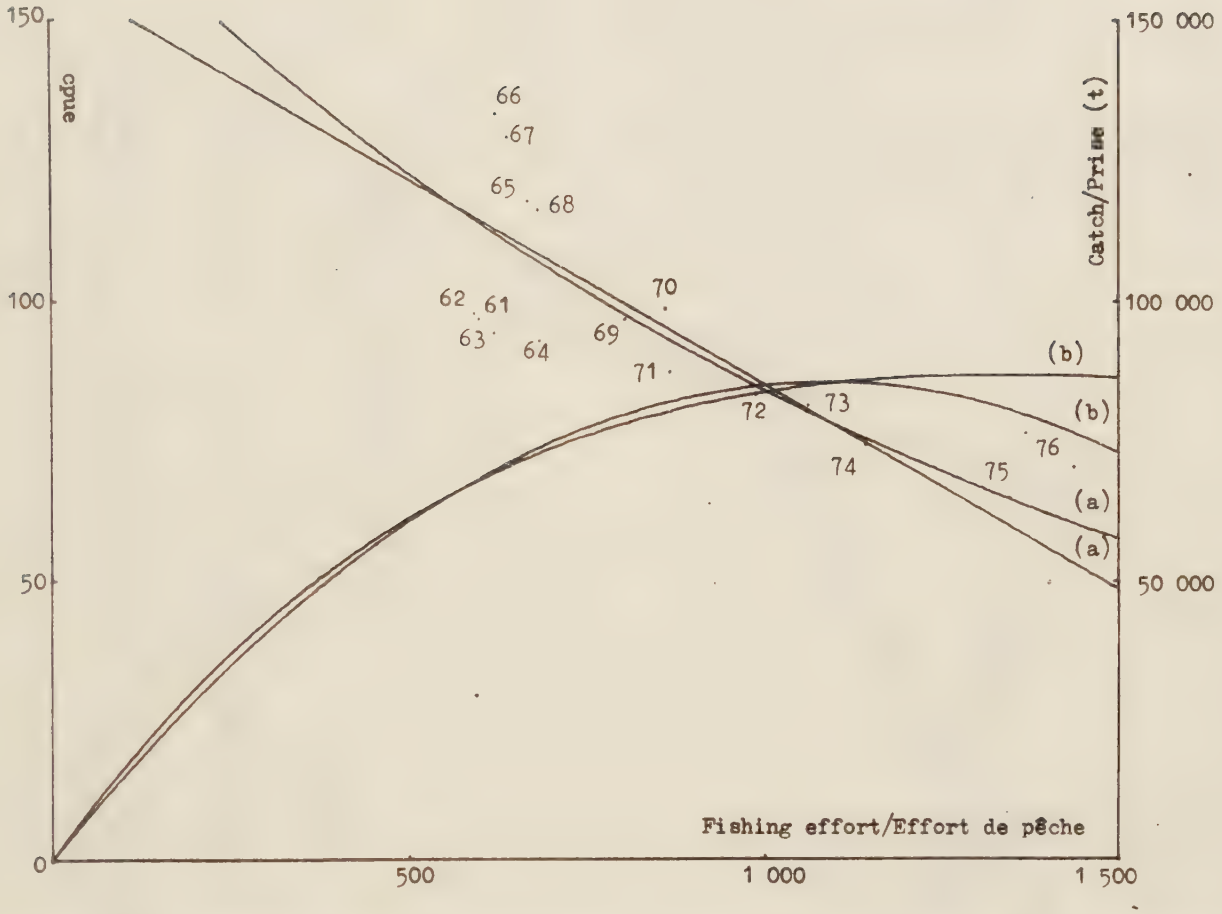

Figure 11 - Demersal fisheries in Sub-area 37.5: Relationship between cpue and fishing effort (2 years average) and resulting yield curve (data from Table 17); (a) linear fitting: r = - 0.79; (b) exponential fitting: r = - 0.84

- Pêcheries démersales dans la Sous-zone 37.5: Relation entre la cpue et l'effort de pêche (moyenne sur deux ans) et courbe de production correspondante (données du tableau 17): (a) ajustement selon une fonction linéaire, r = - 0,79; (b) ajustement selon une fonction exponentielle, r = - 0,84

Figure 12 - Italian and Tunisian trawl fisheries in sub-area 37.5: relationship between cpue and fishing effort (average over 2 and 3 years) and resulting yield curves: (a) linear fitting: r = -.89/.92; (b) exponential fitting: r = -.91/.93

- Pêcheries au chalut italienne et tunisienne dans la sous-zone 37.5: relation entre la cpue et l'effort de pêche (moyenne sur 2 et 3 ans) et courbes de production correspondantes: (a) ajustement selon une fonction linéaire, r = -0,89/0,92; (b) ajustement selon une fonction exponentielle, r = -0,91/0,93

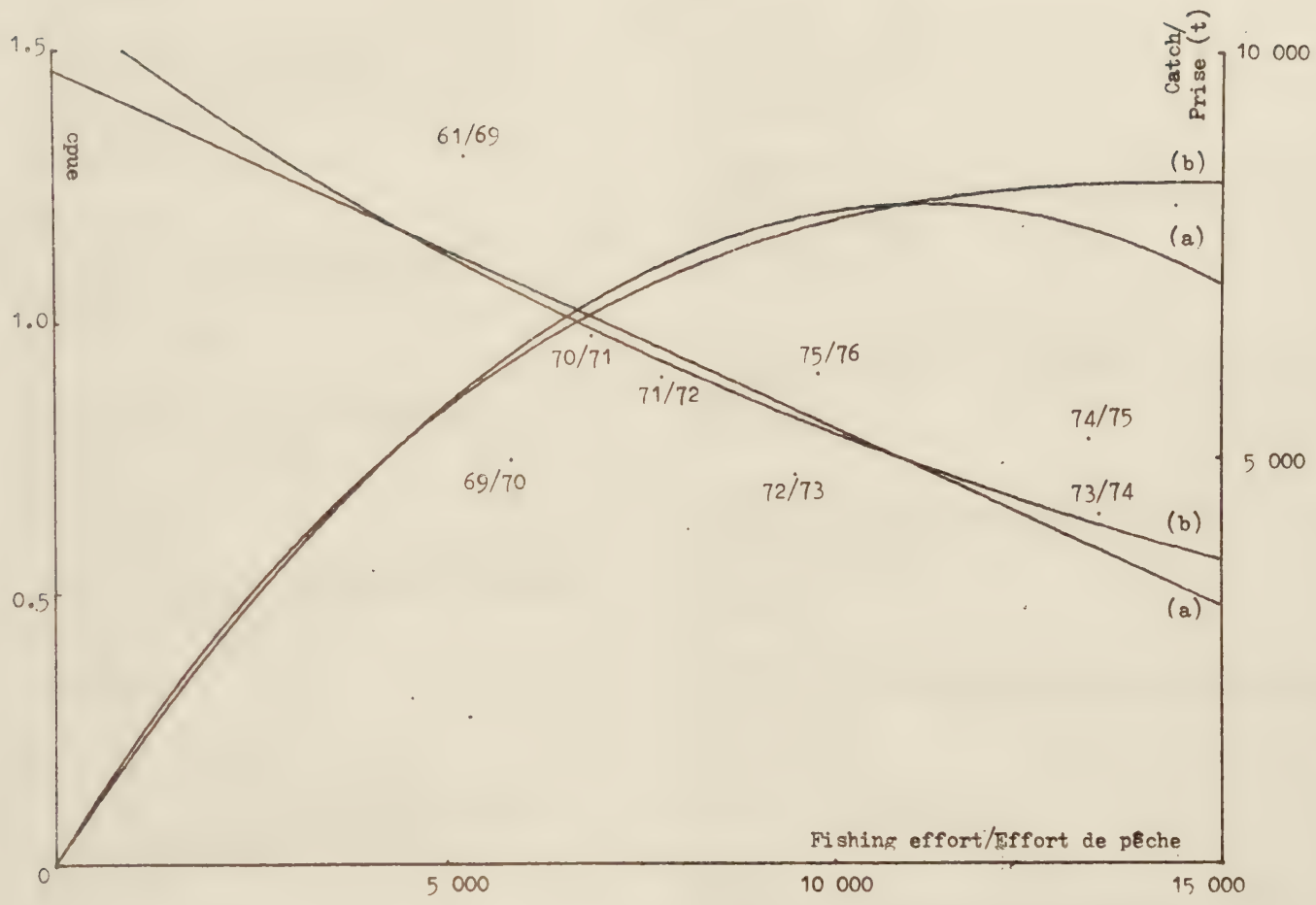

Figure 13 - Tunisian pelagic fishery in Sub-area 37.5: Relationship between cpue and fishing effort and resulting yield curve; (a) linear fitting: r = - 0.64; (b) exponential fitting: r = - 0.66

- Pêche pélagique tunisienne dans la Sous-zone 37.5: relation entre la cpue et l'effort de pêche et courbe de production résultante: (a) ajustement selon une fonction linéaire, r = - 0,64; (b) ajustement selon une fonction exponentielle, r = - 0,66

LISTE DES PARTICIPANTS/LIST OF PARTICIPANTS

1) EXPERTS

ALEXANDROVA , K. (Mme/Mrs.)
Institute of Fisheries
Tsservenoarmeisky 4
9000 Varna
Bulgarie/Bulgaria

BOUHLAL, M.
Institut scientifique et technique d'océanographie et de pêche (INSTOP)
Salammbô
Tunisie/Tunisia

CRESPO, J.
Instituto Español de Oceanografía
Laboratorio de Málaga
Paseo de la Farola 27
Málaga
Espagne/Spain

DEMETROPOULOS, A. (Président/Chairman)
Fisheries Department
Tagmatarchou pouliou 5-7
Nicosia
Chypre/Cyprus

DREMIERE, P.-Y.
Centre de recherches de Sète
Institut scientifique et technique des pêches maritimes (ISTPM)
1, rue Jean Vilar
34200 Sète
France

FIRRETTI, M.
Laboratorio di Tecnologia della Pesca
Molo Mandracchio
60100 Ancona
Italie/Italy

HAKOU-TAHRA, J.
Institut scientifique des pêches maritimes
Rue de Tiznit
Casablanca
Maroc/Morocco

JUKIC, S.
Institut za oceanografija i ribarstvo
P.P. 114
Split
Yougoslavie/Yugoslavia

KARA, F.
Su Urünleri Bolge Müdürlügü
Samsun
Turquie/Turkey

LEVI, D.
Laboratorio di Tecnologia della Pesca
Molo Mandracchio
60100 Ancona
Italie/Italy

OLIVER-REUS, P.
Laboratorio Oceanográfico de Baleares
Muelle de Pelaires
Palma de Mallorca
Espagne/Spain

PEDICINI, T.
Istituto Centrale di Statistica
Via Balbo
00184 Roma
Italie/Italy

PICCINETTI, C.
Laboratorio di Biologia Marina e Pesca
Viale Adriatico 54
61032 Fano
Italie/Italy

TSIMENIDES, N.
Institute of Oceanographic and Fisheries Research
Aghios Kosmas
Hellinikon
Grèce/Greece

2) OBSERVATEUR/OBSERVER

CROSS, D.
Statistical Office of the European Communities
EUROSTAT, Bâtiment Jean Monnet
Boîte postale 1907
Luxembourg/Luxemburg

3) DEPARTMENT DES PÊCHES DE LA FAO/ FAO DEPARTMENT OF FISHERIES

SILVA, L.I.J.
Adjoint au Sous-Directeur général/Assistant to Assistant Director-General

CHARBONNIER, D.
Secrétaire du CGPM/Secretary of GFCM

SSENTONGO, G.W.
Spécialiste des ressources halieutiques/ Fishery Resources Officer

TROADEC, J.-P.
Secrétaire technique du Groupe de travail du CGPM/ Technical Secretary of the GFCM Working Party

AGENDA

1. Adoption of the agenda and arrangements for the session

2. Mesh size measurements on trawls used in national fisheries

3. Assessment of stock state

   3.1 Updating of existing assessments

   3.2 Attempts to evaluate not yet assessed stocks

4. Control of fishing in trawl fisheries

   4.1 Urgency of the matter

   4.2 Direct and indirect measures (kind and effects) already taken at national level

   4.3 Possible actions and contribution of the Working Party

5. Progress achieved in the firm establishment of the regional scheme for the collection and compilation of statistics on stocks and fisheries

   5.1 Allocation of national catches according to the GFCM list of species

   5.2 Geographical grid for the collection of statistics

   5.3 Collection of effort and cpue data

   5.4 National programmes of biological sampling

   5.5 Possible actions at national and regional levels

6. Surveys (trawling, acoustic, etc.) as an alternative method for monitoring and assessing the state of stocks

   6.1 Theoretical aspects

   6.2 Operational aspects

   6.3 Recommendations for action

7. Possible measures for enhancing the activities of the Working Party

8. Any other matters

9. Adoption of the report

RENSEIGNEMENTS FOURNIS PAR LES PARTICIPANTS SUR LES MAILLAGES LEGAUX ET CEUX COURAMMENT UTILISES DANS LES PECHERIES NATIONALES AU CHALUT DE FOND

Bulgarie

Dans la mer Noire, la longueur de maille utilisée pour la pêche au chalut de la seule espèce démersale relativement importante, le turbot (Psetta maeotica), est de 180 mm de noeud à noeud. Il faut noter que le chalutage est interdit depuis trois ans. Actuellement, le turbot est essentiellement pêché au filet maillant. La Commission mixte des pêches de la mer Noire a fixé à 35 cm la taille minimale de débarquement pour le turbot.

Chypre

Voir annexe 9 "Cyprus National Research Report", Section 1 'Mesh size regulations'.

Espagne

Les dispositions du 31 juillet 1977 précisent que les filets doivent avoir les maillages suivants (maille étirée):

- polyéthylène 40 mm
- polyamide (nylon) 38 mm

Il existe une tolérance provisoire permettant l'utilisation de mailles de 38 et 36 mm respectivement. Le contrôle dans les ports n'est pas effectif. Dans certaines zones on utilise des mailles de taille très inférieure à la norme. Des problèmes sérieux relatifs aux contrôle et aux aspects économiques (coût du remplacement des chaluts et diminution initiale des captures) se posent; ils rendent difficile le changement de la maille.

A part les travaux de sélectivité exécutés à Castellón et déjà portés à la connaissance du CGPM, des expériences ont été réalisées aux Baléares qui se poursuivront en 1978. Certains résultats provisoires de ces expériences faites avec un cul de chalut en nylon à maille de 38 mm situent la taille de première capture du merlu (Merluccius merluccius) entre 10,4 et 12,5 cm. Pour le rouget (Mullus sp.) il semble que la taille de première capture soit supérieure à celle de première ponte. Une grande quantité de picarel (Maena smaris), espèce d'intérêt économique aux Baléares, s'échappe du chalut. Cinq sorties ont été effectuées en 1977 pour étudier la structure des populations de merlu et de rouget. D'autres expériences ont porté sur le picarel, mais on n'en connaît pas encore les résultats.

France

Par arrêté du 2 juin 1964, le maillage minimum des culs de chalut utilisés en Méditerranée française a été limité à 20 mm de côté (40 mm étiré). En France, comme dans de nombreux autres pays exploitant les ressources marines en Méditerranée, le respect de la réglementation en vigueur sur les maillages des chaluts pose un problème délicat.

Les notions de côté de maille et d'ouverture de maille (ou maille étirée) sont différentes. De plus, même en supposant que les mailles d'une pièce de filet présentent à l'achat les dimensions requises, elles pourront subir ensuite des variations notables en rapport avec nombre de facteurs. Pour fixer les idées, une série de mesures effectuées en magasin au moyen d'une jauge CIEM sur une pièce de filet neuve et sèche, vendue comme maillage de 40 mm étiré, a donné pour valeur moyenne d'ouverture de maille 36,4 (polyamide tressé, noué, 400 m/kg; caractéristiques communes à la très grande majorité des culs de chalut employés en Méditerranée française).

- Maillages couramment utilisés (toutes les mesures citées ont été faites à la jauge CIEM (4 kg) sur des filets usagés et humides)

Les 40 mm retenus dans plusieurs réglementations nationales l'avaient été de manière assez arbitraire, à une époque où les données scientifiques qui auraient pu permettre de dire si cette valeur correspondait effectivement aux conditions moyennes d'une exploitation optimale faisaient défaut. Quelles que puissent être les conclusions des études sur l'aménagement des pêcheries méditerranéennes, il semble que l'on risque de se heurter, dans certains cas tout au moins, à des réticences pour faire correspondre réglementation et pratique, lesquelles sont sensiblement différentes, et ce sans doute plus souvent en Méditerranée qu'ailleurs.

En France, la majorité des chalutiers emploient des maillages qui, humides et après usage, présentent une ouverture de maille moyenne de 35 mm.

Toutefois, certains chalutiers de faible tonnage habitués à un certain type de pêche et qui recherchent des espèces de petite taille utilisent des mailles d'ouverture moyenne égale à 26 mm. D'autre part, certains navires sont tentés — pour éviter un problème saisonnier d'emmaillage de petits pélagiques (sardine, anchois) dans la maille de 40 mm étirée — d'adopter une dimension de maille plus petite: l'ouverture moyenne mesurée est égale à 28 mm pour ces navires.

Des mesures réalisées en janvier 1978 permettent d'estimer la valeur moyenne d'ouverture des mailles réellement employées à 33 mm, compte tenu de l'importance relative des différentes catégories de navires signalés ci-dessus.

On trouvera par ailleurs dans l'annexe 4 les résultats de mesures comparatives réalisées sur une même série de mailles au moyen d'une jauge triangulaire et d'une jauge CIEM. Cette étude a été faite dans le seul but de permettre une conversion des mesures trouvées à la jauge triangulaire par les services officiels de contrôle en "unités-jauge CIEM" qui doit servir de référence pour l'expression des résultats.

Italie

Les chalutiers italiens qui pêchent dans les zones contrôlées par d'autres états méditerranéens sont astreints par les accords bilatéraux à utiliser le maillage de 40 mm recommandé par le CGPM.

Il ne devrait pas être trop difficile de convaincre, par un patient travail de démonstration, les pêcheurs travaillant au large d'adopter de façon quasi générale le maillage de 40 mm. Un bon exemple de ce que l'on peut obtenir d'une collaboration étroite entre chercheurs et pêcheurs est fourni par les résultats obtenus par le Laboratoire provincial d'études et de recherche sur la pêche auprès des pêcheurs de Toscane.

Le problème est plus ardu avec les pêcheurs littoraux. Leurs longues traditions et l'existence de nombreuses pêcheries spécialisées (par exemple sur Atherina sp., sur les gobiidés, etc.) sont à l'origine de leurs réticences. Des dispositions prévoyant des dérogations pour les pêcheries spécialisées, spécifiant les méthodes et instruments de mesure, comme la nature des principales pêcheries (au chalut de fond par opposition au chalut pélagique ou semi-pélagique, à la senne de plage, etc.) doivent être introduites dans la législation italienne actuelle sur les pêches. Un premier projet de décret ministériel a été préparé.

Malgré les difficultés réelles que cela pose, plusieurs laboratoires italiens étudient actuellement de près la possibilité d'envoyer du personnel à bord des chalutiers dans le but de mesurer les maillages effectivement employés, et cela indépendamment des contrôles que pourra entreprendre l'administration et des dispositions légales qui pourront être prises.

Il faut noter que l'estimation du maillage moyen couramment utilisé demande que les mesures soient distribuées selon un plan statistique qui tienne compte de la répartition des chalutiers dans les diverses strates identifiables. Le Secrétariat du CGPM sera tenu informé de ce qui sera réalisé dans ce domaine.

Maroc

Voir annexe 11 "Progrès réalisés au plan national et armement marocain en Méditerranée" par J. Hamou-Tahra, chapitre 1, section 2 'Maillage des chaluts utilisés'.

Tunisie

Les mailles du cul de chalut ont en Tunisie des dimensions variables suivant les régions. Dans le nord, la maille a une dimension de 40 mm étirée; au sud et à l'est où se concentre la grande majorité de la flottille, la maille est de 38 mm et parfois, mais dans des cas très rares, elle est de 36 mm. Ceci s'explique par le fait que dans cette dernière région les prises en poissons de petite taille (Maena smaris) sont relativement plus importantes que dans la région nord.

Le service de législation des pêches, organisme sous la tutelle de la Direction des pêches et qui dispose d'agents dans tous les ports, contrôle les maillages utilisés. Par ailleurs l'Office national des pêches (ONP), principal exploitant en Tunisie, confectionne lui même les chaluts pour ses bateaux et pour la grande majorité des autres armateurs. L'Office, organisme étatique, respecte le maillage fixé par le Gouvernement.

L'Institut national scientifique et technique d'océanographie et de pêche (INSTOP) a déjà effectué des travaux sur la sélectivité en déterminant celle du chalut méditerranéen utilisé pour le merlu (Merluccius merluccius) et a contribué avec le projet du Programme des Nations Unies pour le développement (PNUD) aux mesures de sélectivité du chalut à grande ouverture verticale. Ces études de sélectivité se poursuivent à l'INSTOP, d'une part pour le rouget barbet (Mullus barbatus) et le pageot (Pagellus erythrinus) et, d'autre part, en essayant d'adopter d'autres types de chalut qui ont montré une efficacité de pêche importante en Atlantique et en Méditerranée. L'ONP de son côté essaye actuellement de modifier le chalut méditerranéen en faisant appel aux services des experts et aux bateaux de la FAO et de l'Institut scientifique et technique des pêches maritimes (ISTPM) de France.

Yougoslavie

La taille de la maille utilisée dans les pêcheries nationales varie entre 26 et 30 mm au maximum (maille étirée). On utilise essentiellement des culs de chalut italiens sans noeuds. La loi antérieure et celle qui sera adoptée en 1978 prévoient une taille de 40 mm (maille étirée). Cependant, les mailles de moins de 40 mm pourront être utilisées jusqu'à la fin de 1978.

METHODES DE MESURE DU MAILLAGE

MESURES COMPARATIVES DE L'OUVERTURE DE MAILLE DANS LES POCHES DE CHALUT

par
P.Y. Dremière
Institut scientifique et technique des pêches maritimes (ISTPM)
Sète, France

1. Le Comité de l'aménagement des ressources du Conseil général des pêches pour la Méditerranée, par sa recommandation I/76/1, a fixé en 1976 des modalités de mesure pour les maillages utilisés par les chalutiers en Méditerranée. Il y est dit notamment:

"...

Les personnes et les navires relevant de leur juridiction ne devront utiliser, pour la pêche dans la zone de compétence du CGPM, aucun chalut ayant une ouverture de maille inférieure à 40 mm, mesurée comme défini ci-après:

- l'ouverture de la maille sera mesurée, de préférence avec la jauge du Conseil international pour l'exploration de la mer (CIEM)

- les contrôles pourront se faire également avec une jauge triangulaire pourvu que celle-ci soit étalonnée par rapport à la jauge CIEM dont les mesures serviront de référence

- la valeur retenue pour l'ouverture de la maille d'un filet sera la moyenne des mesures d'une série de 20 mailles consécutives situées sur le dessus de la poche en suivant une ligne parallèle à son axe longitudinal et commençant par l'extrémité postérieure de la poche, à une distance d'au moins cinq maille en avant de cette extrémité

- la rangée ne devra pas être proche des lisières, et il ne faudra pas mesurer les mailles voisines des ralingues ou des coutures

- les filets seront mesurés mouillés et après usage

..."

2. Ce paragraphe, qui précise la méthode et les conditions de mesure du maillage, indique que si les contrôles sont faits avec une jauge triangulaire, celle-ci doit être étalonnée par rapport à la jauge CIEM dont les mesures serviront de référence.

3. L'étude préliminaire entreprise par le laboratoire de l'ISTPM à Sète vise à permettre la conversion des mesures effectuées à la jauge triangulaire en mesures correspondant à celles effectuées à la jauge CIEM. Les données figurant dans les tableaux 1 à 3 résument les résultats obtenus lors d'une première série de mesures comparatives.

MATERIEL ET METHODES

Poches de chalut

4. Deux poches fabriquées à partir d'alèzes différentes ont été étudiées:

- polyamide noué, câblé, 650 m/kg (R 1 540 tex), mailles de 37,4 mm de côté (mesure à la règle graduée sur 5 mailles étirées consécutives d'une même rangée)

- polyamide noué, tressé, 600 m/kg (R 1 666 tex), mailles de 38,8 mm de côté (même procédé de mesure que ci-dessus).

Ces deux poches provenaient de chaluts usagés et toutes les mesures ont été faites le filet étant mouillé.

Jauges

5. Deux types de jauge triangulaire, susceptibles d'être utilisés en Méditerranée française, ont été retenus pour les mesures:

- triangulaire à bords rectilignes: type 1 , épaisseur 2 mm (fig. 1)

- triangulaire à bords découpés: type 2 , épaisseur 2 mm (fig. 2)

La jauge CIEM qui doit servir de référence est, rappelons-le, une jauge longitudinale à pression normalisée, un dispositif à ressort bloquant la poignée mobile lorsque cette pression (4 kg) est atteinte. Les résultats de mesures effectuées avec ce type d'instrument sont plus exacts et plus cohérents que ceux résultant de l'emploi des jauges triangulaires, la force physique de l'observateur et sa façon de lire les mesures jouant pour ces dernières un rôle non négligeable.

Méthode de lecture

6. Des graduations sont portées sur les jauges triangulaires seulement tous les cinq millimètres. De plus, sur la jauge de type 1 , le trait correspondant à certaines graduations (15, 25, 35, ..., mm) n'atteint pas les bords de l'instrument (voir fig. 1). Si la maille pénétrée par la jauge se place sur celle-ci au niveau d'une graduation bien matérialisée, la lecture sera aisée. Par contre, une position intermédiaire peut inciter un observateur non averti à arrondir systématiquement les valeurs de ses mesures à l'unité de graduation soit inférieure, soit supérieure, soit la plus proche. On a tenu compte de cette éventualité et l'on a comparé les résultats obtenus de cette façon avec ceux dus, lors des mêmes observations, à une interpolation de lecture au niveau réellement atteint par la maille entre deux graduations de la jauge.

Influence de l'observateur

7. Le résultat des mesures pouvant différer notablement selon la force avec laquelle la jauge est enfoncée dans les mailles et selon la façon dont sont faites les lectures, les mêmes observations ont été répétées par trois personnes différentes.

Nombre et emplacement des mesures

8. Les dimensions des mailles pouvant varier autour d'une valeur moyenne d'une rangée à une autre, les différentes mesures ont été effectuées sur les mêmes trois rangées parallèles de vingt mailles de long chacune. Ces rangées étaient situées sur le dessus et au voisinage de la partie postérieure de la poche des chaluts. Elles étaient de plus orientées parallèlement à l'axe principal des filets et suffisamment éloignées des coutures ou ralingues pour que les mesures n'en soient pas affectées. Afin que la chronologie des mesures sur une même maille n'oriente pas les résultats dans un sens particulier l'ordre de passage des observateurs et des jauges a été fixé au hasard.

RESULTATS OBTENUS

9. On a noté une variabilité faible entre les moyennes des mesures pour chacune des trois rangées de vingt mailles (toujours inférieure à 0,02). Il en est de même pour les résultats exprimés en fonction de l'observateur. Dans les tableaux qui suivent on a donc regroupé l'ensemble des mesures faites sur les trois rangées par les trois observateurs. Les résultats moyens exprimés de la sorte, tout en tenant compte des faibles variabilités notées, ne les mettent pas en évidence, le but final de l'étude étant de toute manière de comparer divers instruments de mesure de mailles.

10. On peut noter dans le tableau 1 les différences dues à la méthode de lecture sur les jauges triangulaires. Il apparaît que la lecture à une graduation supérieure ou inférieure peut donner une variance faible et faire croire de ce fait à une méthode précise. Or il est évident que ce n'est pas la précision de la méthode qui doit être envisagée mais simple-

ment le fait que, dans certains des cas étudiés, la maille mesurée a stoppé la pénétration de la jauge à un niveau proche d'une graduation marquée. Dans ce cas il est normal que la dispersion des mesures soit faible autour d'une moyenne voisine de cette valeur de graduation, même si l'on considère que le principe de lecture est imprécis en soi.

11. Il convient donc de recommander que lors des mesures de mailles les lectures soient faites par interpolation entre deux graduations marquées sur la jauge triangulaire et non par arrondi à une valeur voisine.

12. Le tableau 2, qui récapitule l'ensemble des résultats (en ne retenant pour les jauges triangulaires que les lectures par interpolation) montre — comme on pouvait s'y attendre— que le coefficient de pénétration de la jauge à bords découpés (type 2) est plus faible que celui de la jauge à bords rectilignes,(type 1), Ceci est dû aux angles que font entre eux les côtés des jauges, angle plus ouvert pour la jauge de type 2 — sur les portions non parallèles — que pour le type 1. A pression égale la jauge à bords découpés pénètrera moins loin dans la maille que la jauge à bords rectilignes. Les conversions de mesures devront tenir compte de ce fait en précisant le type de jauge triangulaire utilisé.

13. Ce tableau 2 montre de plus que dans tous les cas — pour les maillages et les forces de fil étudiés — l'ouverture moyenne de maille obtenue à la jauge CIEM est supérieure à celle trouvée avec les deux jauges triangulaires. De plus, la comparaison des différences entre les moyennes jauge triangulaire et jauge CIEM met en évidence le fait que l'élasticité du polyamide tressé étudié est plus grande que celle du câblé, à la pression de 4 kg.

14. Dans l'expression des résultats de mesures il conviendrait donc de préciser non seulement la force des fils entrant dans la constitution des mailles mais également leur mode de confection.

15. Il ressort également du tableau 2 que des résultats de mesures faites à la jauge triangulaire pourraient, en première approximation, être exprimés en valeurs à la jauge CIEM par l'application, en guise de coefficients correctifs, des différences en pourcentage relevées entre les résultats des deux systèmes de mesure, pour des textiles comparables à ceux étudiés. Ces différences en pourcentage sont résumées dans le tableau 3.

16. Il ressort de ce tableau que les résultats obtenus avec une jauge triangulaire doivent être majorés dans tous les cas si l'on veut les exprimer en valeurs à la jauge CIEM et d'autant plus qu'il s'agit de nylon tressé et/ou de mesures faites avec une jauge de type 2 (à bords découpés).

RESUME ET CONCLUSIONS

17. Le but des réglementations sur le maillage étant de laisser aux poissons de petite taille la possibilité de croître avant d'être capturés par une maille de dimension donnée, il importe dans un premier temps de connaître la grandeur des maillages réellement employés sur les pêcheries commerciales. L'échappement du poisson à travers une maille dépendant plus de l'ouverture de celle-ci (vide de maille réel compris entre deux noeuds opposés d'une même maille étirée) que de la mesure de son côté par exemple (le côté comprenant deux demi-noeuds), il importe de bien préciser les instruments et la méthode les plus appropriés. On a vu ci-dessus quels types de jauges pouvaient être employés en Méditerranée française et quels peuvent être les rapports entre résultats trouvés — pour certaines mailles et forces de fil employés — au moyen de ces différents appareils de mesure.

18. L'utilisation généralisée de jauges longitudinales (à pression normalisée) étant difficilement envisageable étant donné le prix de revient de ces appareils, il convient de bien définir les critères d'utilisation des jauges triangulaires ainsi que les standardisations possibles au niveau de l'expression des résultats. Ainsi serait-il souhaitable que des études et des mesures comparatives puissent être poursuivies sur des poches de chaluts faites d'autre fils de forces différentes afin de couvrir toute la gamme des pratiques pro-

fessionnelles rencontrées en Méditerranée. Il nous paraît également souhaitable que le Comité de l'aménagement des ressources puisse préciser la méthode de lecture à retenir lors des mesures de maillage à la jauge triangulaire (interpolation). Tout ceci contribuerait, compte-tenu des termes du paragraphe 9 du présent rapport, à une meilleure approche des conditions d'une exploitation rationnelle des stocks par le choix de maillages réellement appropriés.

Tableau 1 - Ensemble des mesures réalisées sur les trois rangées de vingt mailles chacune et par les trois observateurs

a) Polyamide câblé, maille de 37,4 mm de côté

	JAUGE TRIANGULAIRE					
	Méthode de lecture					
	type (1), bords rectilignes			type (2), bords découpés		
	Graduation		Interpolation	Graduation		Interpolation
n	180	180	180	180	180	180
$\bar{x}$	30,11	34,67	32,47	29,97	33,06	30,73
s^2	1,38	1,56	1,46	0,14	5,97	0,60

b) Polyamide tressé, maille de 38,8 mm de côté

	JAUGE TRIANGULAIRE					
	Méthode de lecture					
	type (1), bords rectilignes			type (2), bords découpés		
	Graduation		Interpolation	Graduation		Interpolation
n	180	180	180	180	180	180
$\bar{x}$	33,31	36,67	35,07	30,81	34,94	33,39
s^2	5,91	5,59	2,45	3,68	1,39	1,91

Tableau 2 - Récapitulation des principaux résultats obtenus au moyen des différentes jauges. Pour les jauges triangulaires, on a retenu seulement les valeurs dues à une interpolation de lecture lors des mesures

	Polyamide câblé (650 m/kg)			Polyamide tressé (600 m/kg)		
	Jauge triangulaire		Jauge CIEM	Jauge triangulaire		Jauge CIEM
	type (1)	type (2)		type (1)	type (2)	
n	180	180	60	180	180	60
$\bar{x}$	32,47	30,73	34,40	35,07	33,39	37,73
s^2	1,46	0,60	0,92	2,45	1,91	1,69

Tableau 3 - Pourcentages de différence relevés entre les résultats de la jauge triangulaire et de la jauge CIEM. On pourrait les utiliser comme coefficients de conversion de résultats obtenus avec la jauge triangulaire en "valeur à la jauge CIEM", ceci pour des maillages et textiles comparables à ceux étudiés ici

Polyamide 600-650 m/kg	Jauge triangulaire utilisée	
	type (1)	type (2)
Câblé	+ 5,9 %	+ 11,9 %
Tressé	+ 7,6 %	+ 13,0 %

ANNEX(E)

Tableau 1 a - Inventaire des données actuellement disponibles sur les pêcheries au chalut de fond

Table 1 a - Inventory of data at present available on bottom trawl fisheries

Pays Country	Sous-zone(s) exploitée(s) et principales pêcheries Exploited sub-area(s) and main fisheries	Mesures de mailles couramment utilisées pour les culs de chalut Measurement of currently used codend mesh			Disponibilité de distribution de longueur (moyenne annuelle) par espèce pour les captures au chalut Availability of length distribution (annual average) by species for trawl catches		Disponibilité de données sur la sélectivité. (Par espèce et/ou par type de chalut) Availability of data on selectivity, (By species and/or by type of trawl)	Laboratoire responsable Responsible laboratory
		Fréquence des mesures Measurement frequency	Type de jauge Type of gauge Triangulaire Flat	 CIEM ICES	Pêches commerciales Commercial fisheries	Campagnes de prospection Exploratory cruises		
Bulgaria	37.8	Trawling forbidden since 1973			Turbot (1974-1975)	Turbot(data provided to GFCM in 1973)		Institute for Fisheries, Varna
Cyprus	37.7 local waters	All fleet (10 trawlers) 2-4 times/year		34 mm	1970-1974 Mullus barbatus Mullus surmuletus Maena smaris		Available for 34 and 40 mm nets on: Mullus barbatus Mullus surmuletus Maena smaris	Department of Fisheries, Nicosia
Espagne	37.1	Contrôles occasionnels par l'administration Résultats inconnus	Employée par l'administration		Etudes ponctuelles ayant donné lieu à des publications. Pas d'échantillonnage systématique	Mullus spp. Merluccius merluccius	Chalut de type espagnol Mullus spp. Merluccius merluccius Maena smaris Merlangius merlangus	Laboratoire océanographique des Baléares
France	37.2 - 37.3 Petits chalutiers côtiers. Chalutiers de puissance >300 ch travaillant sur l'ensemble du plateau continental et talus éventuellement)	Une série de mesures en janvier 1978 par ISTPM. Quelques contrôles occasionnels par les services officiels; résultats non connus	Par les services officiels de contrôle Possibilité de conversion entre les deux types de mesures	Par ISTPM	Aucune donnée existante pour le chalut de fond; quelques données sur Sardina pilchardus pour le chalut boeuf pélagique	Quelques données disponibles sur Merluccius merluccius Trisopterus minutus capelanus Mullus spp. Pagellus erythrinus et quelques autres espèces mais non extrapolables aux captures commerciales	Chalut de type italien Trisopterus minutus capelanus Chalut à grande ouverture verticale Trisopterus minutus capelanus	Institut scientifique et technique des pêches maritimes (ISTPM), Sète
Greece	37.5 - 37.6	Occasionally by official authorities (coast guards)	x			Sub-area 37.6 Period 1971-1977 Merluccius merlucoius Mullus barbatus Pagellus erythrinus		Institute of Oceanography and Fisheries Research, Athens
Italie	37.3 Tyrrhénienne moyenne	Deux années d'observation			Oui, sur les principales espèces de fond			Laboratoire provincial d'études et de recherche sur la pêche, Livourne
	37.4					Nephrops norvegicus	Merlucoius merlucoius Mullus spp. Trisopterus minutus capelanus Nephrops norvegicus	Laboratoire de technologie de la pêche, Ancône
	37.4	Pas de mesures régulières			Solea vulgaris	Merlucoius merlucoius Mullus barbatus Pagellus erythrinus Nephrops norvegicus Trisopterus minutus capelanus	Chalut type italien Mullus barbatus	Laboratoire de Biologie marine et de pêche, Fano
Maroc	37.1							Institut scientifique des pêches maritimes, Casablanca
Tunisie	37.3 37.5	Pas de mesures scientifiques, mais contrôles occercitifs occasionnels	Ni plate ni CIEM, mais pyramidale		Merluccius merlucoius Mullus spp. Pagellus erythrinus Trachurus trachurus Crevettes	Mêmes espèces	Merluccius merlucoius Mullus spp. Pagellus erythrinus Chalut méditerranéen Chalut à grande ouverture verticale	Institut scientifique et technique d'océanographie et de pêche (INSTOP), Salammbô
Turkey	37.6	Occasional	x		Merlangius merlangus Psetta maxima Mullus spp.	Eastern part of the Black Sea	Bottom trawl (Mediterranean type) Merlangius merlangus euxinus Mullus spp.	Hydrobiological Research Institute, Istanbul
	37.7							Regional Fishery Directorate, Samsun
	37.8							Hydrobiological Laboratory, Izmir
Yugoslavia	37.4 Coastal trawl fishery	Occasional, mostly by inspectors and scientists Knotless synthetic PP mm 24 mm 26 mm 28 mm 30		x	Merluccius merlucoius Nephrops norvegicus	Merluccius merlucoius Nephrops norvegicus Mullus barbatus Pagellus erythrinus Gadus capelanus Trachurus trachurus All species of Chondrichthyes Zeus faber	Italian bottom trawl knotted mesh Merluccius merlucoius Mullus barbatus Pagellus erythrinus Trachurus trachurus Nephrops norvegicus	Institute for Oceanography and Fisheries, Split

Tableau 1 b - Inventaire des données sur les pêcheries au chalut de fond
que les membres du groupe de travail s'efforceront de rassembler avant juin 1978 ou janvier 1980

Table 1 b - Inventory of data on bottom trawl fisheries
which will tentatively be collected by the members of the working party before June 1978 or January 1980

Pays Country	Sous-zone(s) exploitée(s) et principales pêcheries Exploited sub-area(s) and main fisheries	Mesures de mailles couramment utilisées pour les culs de chalut Measurement of currently used codend mesh			Disponibilité de distribution de longueur (moyenne annuelle) par espèce pour les captures au chalut Availability of length distribution (annual average) by species for trawl catches		Disponibilité de données sur la sélectivité. (Par espèce et/ou par type de chalut) Availability of data on selectivity. (By species and/or by type of trawl)	Laboratoire responsable Responsible laboratory
		Fréquence des mesures Measurement frequency	Type de jauge Type of gauge Triangulaire Flat	 CIEM ICES	Pêches commerciales Commercial fisheries	Campagnes de prospection Exploratory cruises		
Bulgaria	37.8				Trawl forbidden	Turbot (possibly)		Ribno Stopanstvo Burgas
Cyprus	37.7						1980 Experiments to be repeated with 34, 36, 38 and 40 mm codends with cover	Department of Fisheries, Nicosia
Espagne	37.1				1980 Merluccius spp ++ Mullus spp. ++ Gadus spp.	1980 Merluccius spp. Mullus spp. Gadus spp.	1980 Merluccius spp. Mullus spp. Gadus spp.	Laboratoire océanographique des Baléares
France	37.2 37.3	Si possible une série de mesures annuelles par l'ISTPM			1980 Merluccius merluccius Mullus spp. Solea vulgaris		1978 Chalut italien M. merluccius Mullus spp. Chalut à grande ouverture verticale M. merluccius Mullus spp.	Institut scientifique et technique des pêches maritimes (ISTPM), Sète
Greece	37.6				1980 Trachurus spp. M. merluccius Pagellus erythrinus Nephrops norvegicus Parapenaeus longirostris		1980 Trawl with 28 mm up to 36 mm mesh size codends	Institute of Oceanography and Fisheries Research, Athens
Italy	37.3 37.4	Mesure de routine des mailles des chaluts				Distribution de longueur pour les principales espèces par campagnes de prospection avec chalutiers commerciaux Poursuite des programme en cours		Laboratoire provincial d'études et de recherches sur la pêche, Livourne Laboratoire de Biologie marine et de pêche, Fano
Maroc	37.1					Trachurus spp. Merluccius spp.	Trachurus spp. Merluccius spp.	Institut scientifique et technique des pêches maritimes. Casablanca
Tunisie	37.3 37.5	Pas de programmes scientifiques prévus			Poursuite des travaux entrepris			Institut scientifique et technique d'océanographie et de pêche (INSTOP), Salammbô
Turkey	37.6 37.7 37.8	Will try to collect some data in the future						Hydrobiological Research Institute, Istanbul Regional Fishery Directorate, Samsun Hydrobiological Laboratory, Izmir
Yugoslavia	37.4	Control will continue in accordance with legislation			Same programme	Same programme		Institute of Oceanography and Fisheries, Split

BULGARIAN RESEARCH REPORT

by

Mrs. K. Alexandrova
Institute of Fisheries
Varna, Bulgaria

1. Sprat (Sprattus sprattus)

Since the last decade sprat has comprised a great proportion of our Black Sea fisheries and has been the main species sought. This is evidenced by the fishery statistics analysis which clearly show a substantial increase in the catches since 1971 when the trawl fishery was first introduced. Before that year, the fishing for sprat was carried out mainly in the inshore area during the March-May period by means of beach seines and trap-nets when approaching the neighbouring littoral zone.

The Black Sea sprat makes local migrations only and its movement to the coast and in the offshore areas is related to seawater temperature, the state of its trophic base and the spawning season.

In the fall, the sprat retires itself in offshore direction and towards the bathypelagic for spawning. In the cold months, February inclusive, its shoals (concentrations) are scattered and therefore it is not easily fishable then and this is indicated by the very low catch-per-unit effort in this season.

In March, when the surface water layers become warmer and the trophic base improves because of the development of eurythermic zooplankton species, and with the end of the spawning season, the sprat concentrates in the 10-20 mile zone where it is actually fished.

In July, when the water body develops a clearly defined anathermic pattern, the sprat migrates to the deeper water strata (40-60 meters) where it is fished in August and in September.

By their structure, the catches in 1977 are characterized by a low abundance of the 1976 year-class. We cannot explain at present the decline of the sprat stocks because in certain cases the low percentage recruitment at age 1 has a high strength at age 2 which indicates that the behaviour and the migrations of the sprat off our coasts are still not fully understood. In the last years, extensive investigations were carried out by experimental fishing using midwater trawl-nets and by acoustic surveys aiming at assessing the state of the sprat stocks. These experiments, however, remained in their initial stage, due to the lack of adequate acoustic instrumentation for this species aboard our research vessel.

Since S. sprattus ranks second in abundance following the Black Sea anchovy (Engraulis encrasicolus) and its stocks are not fully exploited so far, we cannot formulate proposals for a by-quota regulation of the annual catches of this species in the Black Sea.

2. Horse Mackerel (Trachurus mediterraneus)

In 1975 and 1976, the catches of horse mackerel in Bulgarian waters were comparatively high, with values of 1972.8 and 1808 tons respectively. In 1977, the catches suddenly drop by more than 200 percent of the above quantities. This unexpected sharp decline of the spring catches during the period of northward migration of the horse mackerel off the Bulgarian Black Sea coasts is partly due to the sparse distribution of the horse mackerel shoals because of the warming of the offshore water body, and to the fast migration for feeding and spawning by small-sized shoals. These movements coincide with those of the bluefish (Pomatomus saltator). The large decrease of the horse mackerel catches in the fall is also partly

due to its scattered nature and to the high mobility of the shoals caused by the high water temperatures (14-15°C) in October and November and to the poor management of this fishery by the fishery authorities who during the mass migration of the species do not take the necessary steps to control intensive fishing.

On the whole, the horse mackerel stocks are under the mean abundance on many years basis. The 1975 and 1976 year-classes were poor.

3. Black Sea turbot (Psetta maeotica)

The catch and cpue of turbot (Psetta maeotica) in 1977 was at a very low level. Our own observations denoted a trend towards decrease of the stock of this valuable demersal fish species. So, the 1974 and 1975 year-classes were strongly affected by the mass bloom of a planktonic alga, the Exuviaella cordata, which provoked an extensive mortality among the benthic food organisms on the whole North-West Black Sea shelf as a whole. Our country planned steps to conserve and maintain the stocks of this valuable species in equilibrium state. Some of these measures are already in force. The trawl fishery of the turbot has been stopped but instead there are longlines (baited, bottom) and gillnet fisheries. Our Research Institute is formulating a proposal to the Bulgarian Government to request the Government of Turkey to put an end to the intensive fishing for turbot off our coasts for sometime to come. It would be highly appreciated if the Representative of Turkey at this meeting backed up this action which could largely contribute to the rebuilding of stocks of this valuable demersal resource.

4. Black Sea whiting (Odontogadus merlangus)

This species appeared first in our statistics in 1974 but only as a by-catch and, consequently, without any commercial importance to our fishermen. Therefore, we do not intend to intensify this fishery.

5. Black Sea anchovy (Engraulis encrasicolus)

In 1977, we observed an increase of the anchovy catches, which had been low since 1974. Unfortunately, the fishery of this superabundant Black Sea fish species has not been mastered by our fishermen as it occurs in the summer months in our waters only in scattered spawning shoals. That is why we are not able to give an adequate assessment of its stocks.

6. Atlantic bonito (Sarda sarda)

In the last two years there are records of small commercial catches of yearlings of the bonito. This gives us a sound reason to hope that the stocks of this tuna-like fish species will recover, but it is impossible to make the same statement for the common mackerel (Scomber scombrus) which at present is caught as individual specimens only.

EVALUATION DES RESSOURCES EN TURBOT, Scophthalmus maeoticus (Pallas) DEVANT LA COTE BULGARE DE LA MER NOIRE ET MESURES DE SURVEILLANCE

par

L. Ivanov
Institut des pêches
Varna, Bulgarie

et

M. Karapetkova
Institut de Zoologie
Sofia, Bulgaria

1. Les captures du turbot des pays de la mer Noire (tableau 1) ont tendance à diminuer. Cette tendance s'est accentuée depuis 1977 devant les côtes de l'URSS, de la Roumanie et de la Bulgarie. La diminution des prises dans ces pays est due à l'abaissement de la taille des stocks d'une part et à la limitation volontaire des captures de l'autre. La Convention sur la pêche en mer Noire a fixé à 35 cm la longueur minimale de capture pour le turbot (longueur standard) et à 180 mm (de noeud à noeud) la dimension minimale des mailles des filets. En URSS et en Roumanie la pêche au chalut est interdite. En URSS une limite est fixée annuellement aux captures et on se préoccupe de la reproduction artificielle du turbot. En Bulgarie on a pratiquement mis fin ces dernières années à la pêche du turbot au chalut. Les principales captures du turbot sont effectuées par les pêcheurs turcs qui pêchent, hors des eaux territoriales, devant les côtes des autres pays riverains de mer Noire.

2. Il existe toute une série de publications, pourtant souvent contradictoire sur les différents aspects de la biologie du turbot (âge, accroissement, maturation sexuelle, etc.)/1, 4-7, 9, 10, 12-16, 20, 21/. Il est possible que ces différences soient dues aux particularités de la biologie de ce poisson devant le littoral de chaque pays.

3. Dans ce travail on a tiré profit des donnés à long terme sur la composition de taille et d'âge du turbot devant la côte bulgare recueillies et élaborées par M. Karapetkova. Le choix et l'élaboration des méthodes d'analyse, ainsi que les calculs, ont été réalisés par L. Ivanov, tandis que l'interprétation finale est l'oeuvre des deux auteurs.

Croissance en longueur et en poids

4. On utilise la longueur totale L. La longueur standard (l) peut être déduite par la formule:

$$l = 0{,}795\ L \qquad (1)$$

5. L'âge a été déterminé sur les otolithes. On a eu recours à l'équation de Von Bertalanffy (17)* pour ajuster les données moyennes âge/longueur totale relatives à la période 1960-1975:

$$L_t = L_\infty \left[1 - e^{-K(t - t_o)}\right] \qquad (2)$$

$$W = q\ L^n \qquad (3)$$

$$W = W_\infty \left[1 - e^{-K(t - t_o)}\right]^n \qquad (4)$$

où L_t et W_t représentent la longueur et le poids du poisson à l'âge t (années).

6. W_∞, L_∞, K, t_o, n, sont estimés en ajustant les données observées aux fonctions (2) à (4) par la méthode des moindres carrés.

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* Les chiffres suivis d'un astérisque se réfèrent à la liste bibliographique

7. Les figures 1, 2, 3 reprennent les résultats des calculs. Les équations 2 et 4 ne représentent pas correctement la croissance du turbot pour les âges inférieurs à 2 ans; pour cette raison les classes d'âge 0-1 ans et 1-2 ans ne sont pas prises en considération dans l'analyse.

Mortalité totale

8. La valeur du coefficient instantané de mortalité totale (Z) des classes d'âge de 4-8 ans (fig. 4) est estimée à partir des indices moyens de composition d'âge pour la période 1960-1975. On en déduit pour Z une valeur moyenne de 0,707. Z en effet augmente avec l'âge:

4 ans = 0,378; 5 ans = 0,585; 6 ans = 0,790; 7 ans = 1,094; 8 ans = 1,238 .

Stock total

9. La population totale est estimée par l'application d'une variante de la méthode des populations virtuelles (22)* aux données de capture de la Bulgarie au cours de la période 1956-1975. Le coefficient instantané de mortalité par pêche (F) relatif aux classes âgées de plus de 4 ans en 1975, ainsi qu'à la dernière classe d'âge des cohortes représentées dans les captures, est pris égal à 0,5. On admet également que la mortalité naturelle (M_t) change avec l'âge selon le schéma suivant:

Age (années)	2	3	4	5	6	7	8	9	10
M_t	0,25	0,20	0,15	0,20	0,25	0,30	0,35	0,40	0,45

10. Les effectifs totaux de la population sont transformés en biomasse en multipliant les nombres par le poids moyen de chaque classe au cours des années successives. La fig. 5 représente les effectifs des cohortes aux différents âges et années successifs. La fig. 6 représente les biomasses correspondantes. Entre 1956 et 1971 on constate que le stock a varié de la façon suivante entre les âges 2 et 12 ans:

population moyenne annuelle: 509 000 - 876 000 exemplaires et 973 - 1 713 tonnes

cohorte: 410 000 - 857 000 exemplaires et 791 - 1 638 tonnes

11. Le stock tend à baisser, mais de façon limitée jusqu'en 1975. Les valeurs estimées de F figurent dans le tableau 2.

Stock exploité (N_{ex}, B_{ex})

12. Nous avons supposé que le turbot est complètement recruté à la pêcherie à partir de 5 ans, c'est-à-dire que le stock exploité est composé des classes d'âge 5 à 12 ans. On a utilisé la méthode suivante pour estimer le stock exploité entre les âges 2 et 4 ans; on a calculé la valeur moyenne $\overline{F}_{5-12}$ et à partir des données de 1956-74 les paramètre de l'équation:

$$F_5 = a + b\,\overline{F}_{5-12} \qquad (5)$$

13. Cette relation est représentée sur la fig. 7. Au moyen de l'équation 5 on calcule la valeur de F_5; en y additionnant respectivement M_2, M_3, M_4, on obtient Z_2, Z_3, Z_4.

14. Quand $F_5 < F_4$ on conserve la grandeur de F_4. On applique ensuite les expressions suivantes:

$$f_t = \frac{F_t}{Z_t}\left[1 - 1^{-Z_t}\right] \qquad (6)$$

$$N_{t,\ ex} = \frac{C_t}{f_t} \qquad (7)$$

$$d_t = \frac{N_{t,\ ex}}{N_t} \qquad (8)$$

où t est l'âge 2, 3, ou 4 ans.

C_t = capture en nombre de la classe d'âge t

N_t, $N_{t,\ ex}$ = stock total et stock exploité en nombres pour la classe d'âge t

d_t = recrutement partiel en % qui donne la proportion recrutée (stock exploité) du stock total de la classe d'âge t

f_t = coefficient de capture du stock initial de la classe d'âge t

14. Les stocks exploités ainsi calculés sont représentés dans la fig. 8. Au cours de la période 1956-1974 ils varient entre 179 000 et 453 000 exemplaires d'une part et 514 et 1 211 tonnes d'autre part.

15. Ces stocks totaux exploités sont sous-estimés dans la mesure où ils sont déduits des seules prises bulgares. Devant la côte bulgare, les bateaux turcs pêchent aussi le turbot. L'importance de leurs prises nous est inconnue, mais si on suppose qu'elles ont la même composition que les captures bulgares, les stocks réels de turbot doivent être d'autant supérieur aux stocks calculés que le total des prises bulgares et turques dépasse les seules prises bulgares.

16. Le tableau 3 représente les valeurs moyennes de $\bar{F}$, $\bar{M}$ et $\bar{f}$ correspondant au stock total exploité ainsi que de d_t. Les coefficients $\bar{F}$ et $\bar{f}$ expriment la mortalité due à la pêche bulgare et à la pêche turque. Les estimations moyennes pour 1956-1973 (1974) sont les suivantes:

pour le stock total: $\bar{F} = 0{,}232$; $\bar{M} = 0{,}214$; $f = 0{,}187$

pour le stock exploité: $\bar{F} = 0{,}581$; $\bar{M} = 0{,}201$; $f = 0{,}403$

Pour le stock exploité, Z est égal à 0,782, c'est-à-dire qu'il dépasse de peu la valeur de Z calculée à partir de la composition d'âge moyenne (Z = 0,707; fig. 4).

Stock reproducteur

17. On suppose qu'une partie du stock de turbot atteint sa maturité sexuelle pour la première fois à l'âge de 3 ans. A l'âge de 5 ans tous les individus sont sexuellement mûrs. On suppose que la totalité du stock exploité d'âge supérieur à 3 ans est reproducteur. Rétrospectivement, à l'aide du coefficient de survie ($S_{t,\ ex}$) on a évalué la corrélation entre le recrutement et le reste du stock reproducteur (11), cela pour les générations 1953 à 1970 (tableau 4) et 1956 à 1970 (tableau 5).

18. La corrélation moyenne entre le recrutement et le reste du stock donne les résultats suivants:

pour les générations de 1953 - 1970:	recrutement	53,2%
	reste	46,8%
pour le stock de 1956 à 1970:	recrutement	55,3%
	reste	44,7%

pour le stock exploité de 1956 à 1974 (tableau 3): $\bar{Z} = \bar{F} + \bar{M} = 0,782$

$S = 0,458$

$1 - S = 0,542$

19. En examinant l'indice 1 - S au cours des années, on peut le considérer comme à peu près égal au recrutement (54,2%), lequel compense donc la mortalité; on peut aussi considérer que l'indice de survie (45,8%) correspond au reste.

20. Ces estimations sont pratiquement égales à celles que l'on a déterminées par la méthode rétrospective. La structure du stock reproducteur du turbot est le plus souvent du type II selon la classification de Monastirskij (11) et non du type III (prédominance du reste); ceci indique un état de sur-exploitation.

21. Les tailles moyennes du stock reproducteur en 1956-1970 et du stock reproducteur des cohortes nées en 1956-1970 sont proches: 300 900 et 292 000 exemplaires de turbot; cela signifie que le recrutement n'est inférieur que d'une quantité insignifiante.

Stock et recrutement

22. On applique ici l'équation d'Ivanov (2) et celle de Ricker (23)*:

$$R = aE - bE^2 \qquad (9)$$

$$\frac{R}{E} = a - bE \qquad (9.1)$$

$$R = aEe^{-bE} \qquad (10)$$

$$\frac{R}{E} = ae^{-bE} \qquad (10.1)$$

dans laquelle:

E est la biomasse du stock géniteur,

R la biomasse du recrutement,

C la prise,

r le coefficient de corrélation (voir ci-dessous)

et P la probabilité de l'authenticité (voir ci-dessous).

23. La figure 9 représente la relation entre la biomasse du stock reproducteur (E) au début de l'année et l'effectif du recrutement correspondant à l'âge de 2 ans (N_2). On a obtenu pour les paramètres et les limites de confiance les valeurs suivantes (en milliers d'exemplaires et en tonnes):

	Equation (9) et (9.1)	Equation (10) et (10.1)
a	0,614	0,924
b	0,0004	0,0015
B_{opt}	767,5	666,7
$N_{2,\ max}$	235,6	226,7
r	$- 0,727 \pm 0,184$	$- 0,769 \pm 0,171$
P	$>0,99$	$> 0,999$

24. Les courbes de la fig. 9 représentent, en apparence, la relation moyenne stock/recrutement en équilibre pseudo-dynamique. En réalité, les cohortes de 1962 à 71, excepté celles de 1966 et de 1970 ont donné lieu à des recrutements médiocres.

25. La fig. 10 représente la biomasse recrutée; la biomasse du stock géniteur au début de l'année est diminuée des prises bulgares au cours du premier semestre de l'année. On suppose que le turbot capturé n'a pas participé à la reproduction ou bien, s'il y pris part, que la reproduction est compensée par la mortalité naturelle. La biomasse du recrutement en phase de maturité sexuelle ne change pas au début de l'année.

26. On a trouvé pour les paramètres et les limites les estimations suivantes:

	Equation (9) et (9.1)	Equation (10) et (10.1)
a	3,136	4,879
b	0,003	0,0023
E_{opt}	522,7	434,8
R_{max}	819,5	780,6
C_{opt}	296,8	345,8
$E_r = R_r$	712,0	689,1
$E_{C_{max}}$	356,0	269,0
$R_{C_{max}}$	736,2	707,2
C_{max}	380,2	438,0
r	- 0,813 ± 0,156	- 0,840 ± 0,145
P	0,999	0,999

27. Les estimations ci-dessus de capture optimale (C_{opt}) et de capture maximale (C_{max}) incluent également un terme supplémentaire correspondant aux pertes par causes naturelles ($\bar{M} = 0,2$). On évalue la mortalité totale à partir des expressions suivantes:

$$\frac{C_{opt}}{R_{max}} = 1 - S_{opt} \qquad (11)$$

$$\frac{C_{max}}{R_{C_{max}}} = 1 - S_{max} \qquad (12)$$

28. Connaissant S (par les formules 11 et 12) et $\bar{M} = 0,2$, nous trouvons Z, F et f ainsi que la capture possible (en tonnes), susceptible de maintenir le stock géniteur au niveau nécessaire.

	Equation (9) et (9.1)		Equation (10) et (10.1)	
	E_{opt}	$E_{C_{max}}$	E_{opt}	$E_{C_{max}}$
1 - S	0,362	0,516	0,443	0,620
Z	0,449	0,723	0,585	0,968
F	0,349	0,523	0,385	0,768
f	0,201	0,373	0,292	0,492
Capture (tonnes)	164,7	276,4	227,9	347,8

29. Ces résultats montrent que l'on ne doit pas exploiter le stock de turbot au niveau de capture maximale, puisque les valeurs F et Z sont très élevées et font que le stock court le risque de diminuer brusquement et continuellement. De plus, c'est la rentabilité de la pêche qui va baisser (en cas de recrutements faibles).

30. L'exploitation devra s'effectuer au niveau de E_{opt} qui assurera R_{max}. L'équation (10) et (10.1) qui décrit le mieux la dépendance entre E et R montre que F_{opt} correspondant à E_{opt} est égal à 0,385, f = 0,292 alors que la prise correspondante est de 227,9 tonnes.

Age critique (t_c)

31. On utilise l'équation (19)*:

$$t_c = \frac{\ln(nK + M) - \ln M}{K} + t_o \qquad (13)$$

Connaissant t_c on peut déterminer L_c à partir de l'équation (2). Si M = 0,2, t_c sera égal à 5,9 ans; si M = 0,3, t_c sera égal à 3,9 ans.

32. On détermine t_c plus exactement au moyen des équations de Loukachov (8) et de Ricker (23)*, modifiées par Ivanov (3):

$$M_t = 1 - V_t \qquad (14)$$

$$K_t = \frac{S_{o,t}}{V_t} = e^{i_t} - M_t \qquad (15)$$

Dans ces équations:

$$V_t = \frac{W_t}{W_{t+1}} \qquad i_t = \ln\left(\frac{W_t + 1}{W_t}\right) \qquad S_{o,\,t} = e^{-M_t}$$

M_t représente la mortalité naturelle ($1 - S_{o,t}$) avec laquelle une classe d'âge donné (t + 1) garde une biomasse égale à celle de l'année passée (t).

K_t est le critère de variation de la biomasse de la classe d'âge non exploitée; lorsque $K_t = 1$, t est l'âge critique.

33. Les résultats de l'application des équations (14) et (15) sont donnés dans la fig. 11. L'âge critique, lorsque M est constant, est le suivant:

9,3 ans pour M = 0,1
5,4 ans pour M = 0,2
3,3 ans pour M = 0,3

34. Si l'on admet une mortalité différencielle (M_t), l'âge critique est 5,1 ans. La classe d'âge protégée doit être inférieure à l'âge critique. C'est pourquoi la longueur minimale de capture du turbot a été fixée à 35 cm (longueur standard) par la Convention sur la pêche en mer Noire; cette longueur correspond à une longueur totale de 44 cm et à un âge de 3 ans; elle peut être considérée comme scientifiquement étayée. En même temps il faut noter que l'on n'est pas toujours en état de se conformer à la limite de 5 pour cent admise pour les prises accidentelles, spécialement au cours des années où les poissons de 3 ans représentent une quantité condidérable du stock reproducteur.

Niveau économique optimal de mortalité par pêche ($F_{o,1} = F_{opt}$)

35. On a estimé le stock initial (2) et la production par recrue en admettant une mortalité naturelle différentielle en fonction de l'âge (M_t) et un effectif initial à l'âge de 2 ans égal à 1. La pêche commence à l'âge de 3 ans + et se termine à l'âge limite de 12 ans. Le recrutement du stock exploité s'effectue comme suit (en pourcentage):

3 ans = 40%; 4 ans = 75%; 5 ans = 100%

36. Le coefficient instantané optimum de la mortalité par pêche est calculé sur la base de la définition de Gulland et Boerema (18)*. Les résultats sont graphiquement exprimés dans la fig. 12.

37. Le coefficient $F_{0,1}$ s'avère approximativement égal à 0,4. Quand $\bar{M} = 0,2$, le coefficient de capture du stock initial exploité (f_{ex}) est égal à 0,3 (30%).

38. La prise représente 14% en nombre et 20% en poids du stock total (2 - 12 ans). Par rapport à la valeur moyenne de $\bar{F} = 0,581$ (tableau 3) du stock exploité en 1956-1974, $F_{0,1}$ est nettement faible. Ceci signifie que le stock du turbot devant la côte bulgare a été exploité au-dessus de l'optimum économique; cela est attribué aux prises intensives des pêcheurs turcs. L'estimation de $F_{0,1} = 0,4$ est proche de celle que l'on a calculée au moyen de la courbe de reproduction ($F = 0,385$), comme celle pour laquelle le stock reproducteur (E_{opt}) assure le recrutement maximum (R_{max}) et la prise optimale (C_{opt}).

Evolution du stock

39. La cohorte de 1972 qui était présente dans les captures en 1975 s'avère peu nombreuse. De 1973 à 1975 on observait dans les différents secteurs du littoral ouest de la mer Noire un développement massif du phytoplancton, accompagné d'un déficit en oxygène et d'une mortalité intensive des alevins de turbot. On pouvait s'attendre à une forte baisse du recrutement et de la biomasse exploitée à laquelle il donne lieu. Les premiers symptômes de ce déclin furent constatés en 1977 (prises de 63 tonnes, tableau 1). Il est donc indispensable de réduire le taux d'exploitation si l'on ne veut pas que la population de turbot courre le risque de s'effondrer de façon irréversible.

Recommandations relatives à la protection de turbot

40. Interdire la pêche au chalut pour une période non définie. Lors de la pêche du sprat et du merlan au chalut pélagique et semi-pélagique, remettre à l'eau tous les turbots de dimension inférieure à la taille limite légale.

41. Permettre aux pêcheurs bulgares une pêche limitée aux filets et à la palangre; cette limite sera basée en fonction de l'état des stocks, en observant rigoureusement la longueur minimum (35 cm, longueur standard) et la taille minimale des mailles des filets (180 mm de côté).

42. Demander à la République de Turquie d'interdire à ses pêcheurs, pour une période non déterminée, la pêche du turbot dans les eaux du plateau continental bulgare, jusqu'à ce que le stock de turbot se soit reconstitué.

Tableau 1 - Captures du turbot par les pays riverains de la mer Noire (en tonnes)

Année	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
R.P.B.	23	79	135	186	195	160	96	103	255	199	234
U.R.S.S.	1 550	1 450	1 970	2 230	2 370	2 880	2 730	2 030	2 200	1 530	1 500
Année	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**
R.P.B.	458	369	248	215	174	432	443	481	326	426	312
Roumanie					164	182	317	393	248	134	62
U.R.S.S.	690	940	1 230	950	1 220	1 090	1 460	1 291	1 064	1 202	806
Turquie				1 300	1 500	1 200	1 600	1 600	1 700	2 600	1 777
Année	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	
R.P.B.	310	200	268	221	175	293	311	204	217	63	
Roumanie	92	112	89	43	70	118	30	16	26		
U.R.S.S.	855	635	673	710	681	499	349	302	187		
Turquie	2 104	2 707	4 645	3 136	2 689	3 983			1 188		

Y compris la mer de Marmara: par exemple, les captures de la mer de Marmara ont été en 1967 de 249 tonnes; en 1968 de 425 tonnes; en 1969 de 579 tonnes; en 1970 de 465 tonnes et en 1971 de 447 tonnes. Les données manquent pour les autres années.

Tableau 2 - Valeurs estimées de F par cohortes du stock total et du stock exploité (entre parenthèses)

Age / Année	2	3	4	5	6	7	8	9	10	11	12
1956	(0.494) 0.008	(0.494) 0.06	(0.494) 0.16	0.44	0.72	0.675	0.57	0.50	0.50	-	-
1957	(0.876) 0.015	(0.876) 0.17	(0.876) 0.40	0.89	1.285	1.125	0.765	0.50	-	-	-
1958	(0.772) 0.009	(0.772) 0.17	(0.772) 0.425	0.715	1.11	1.74	1.42	0.50	-	-	-
1959	(0.49) 0.009	(0.49) 0.135	(0.49) 0.34	0.49	0.495	0.78	1.16	0.275	-	-	-
1960	(0.425) 0.01	(0.425) 0.09	(0.425) 0.21	0.335	0.69	0.445	1.03	0.50	0.50	-	-
1961	(0.269) 0.02	(0.269) 0.05	(0.269) 0.17	0.205	0.33	0.35	0.305	0.50	-	-	-
1962	(0.472) 0.01	(0.472) 0.16	(0.472) 0.465	0.415	0.55	0.635	1.075	0.50	-	-	-
1963	(0.645) 0.025	(0.645) 0.205	(0.645) 0.345	0.660	0.745	0.88	0.58	0.50	-	-	-
1964	(0.675) 0.03	(0.675) 0.32	(0.675) 0.46	0.75	0.80	0.735	0.60	0.44	-	-	-
1965	(0.517) 0.01	(0.517) 0.195	(0.517) 0.38	0.575	0.42	0.77	0.49	0.53	0.50	-	-
1966	(0.765) 0.02	(0.765) 0.195	(0.765) 0.465	0.78	1.09	1.08	0.76	0.245	0.50	-	-
1967	(0.668) 0.05	(0.668) 0.31	(0.668) 0.50	0.625	0.83	1.08	0.77	1.22	0.50	-	-
1968	(0.711) 0.02	(0.711) 0.29	(0.711) 0.595	0.735	0.835	1.17	0.46	0.265	0.50	-	-
1969	(0.54) 0.01	(0.54) 0.135	(0.54) 0.29	0.54	0.71	0.75	0.31	0.22	0.315	-	-
1970	(0.518) 0.02	(0.518) 0.335	(0.518) 0.42	0.49	0.645	1.30	0.50	0.195	0.50	0.50	0.50
1971	(0.395) 0.02	(0.395) 0.255	(0.46) 0.46	0.34	0.505	0.56	1.75	0.50	0.50	-	-
1972	(0.34) 0.01	(0.34) 0.16	(0.34) 0.33	0.45	0.28	0.225	0.28	0.50	-	-	-
1973	(0.391) 0.03	(0.391) 0.35	(0.61) 0.61	0.57	0.46	0.18	0.145	0.06	-	-	-
1974	(0.497)	(0.497) 0.11	(0.73) 0.73	0.45	0.62	0.85	0.50	0.50	0.50	-	-
1975	-	-	0.50	0.50	0.50	0.50	0.50	-	-	-	-

Tableau 3 – Quantités moyennes estimées des coefficients $\bar{F}$, $\bar{M}$ et $\bar{f}$ pour le stock total (N_{2-12}) et le stock exploité ($N_{ex,2-12}$) ainsi que du coefficient du recrutement en pourcentage (d_t)

Année		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	En moyenne
N_{2-12}	$\bar{F}$	0.148	0.325	0.273	0.187	0.139	0.095	0.228	0.239	0.336	0.257	0.320	0.295	0.263	0.159	0.286	0.214	0.141	0.278		0.232
	$\bar{M}$	0.206	0.211	0.216	0.211	0.215	0.214	0.215	0.215	0.210	0.205	0.221	0.217	0.221	0.215	0.208	0.218	0.221	0.215		0.214
	$\bar{f}$	0.125	0.252	0.216	0.154	0.117	0.082	0.184	0.192	0.259	0.206	0.244	0.231	0.209	0.133	0.226	0.174	0.118	0.219		0.187
$N_{ex,2-12}$	$\bar{F}$	0.513	0.940	0.828	0.503	0.444	0.262	0.487	0.675	0.701	0.533	0.818	0.694	0.736	0.556	0.529	0.420	0.343	0.452	0.605	0.581
	$\bar{M}$	0.199	0.199	0.203	0.196	0.192	0.201	0.208	0.211	0.201	0.186	0.211	0.204	0.201	0.201	0.192	0.195	0.205	0.208	0.213	0.201
	$\bar{f}$	0.367	0.561	0.514	0.362	0.321	0.210	0.351	0.448	0.462	0.380	0.511	0.458	0.478	0.390	0.377	0.314	0.264	0.331	0.413	0.403
d_2		2.2	2.1	1.7	2.4	3.5	0.9	2.9	5.1	5.3	2.6	3.8	9.6	3.7	2.4	5.4	5.4	4.2	9.4	–	4.0
d_3		14.8	26.1	28.6	32.8	24.7	20.5	39.6	39.2	55.6	44.0	32.5	54.2	48.5	29.8	70.1	68.9	50.8	81.5	26.9	41.5
d_4		37.8	55.7	64.2	75.3	54.5	43.8	99.1	61.0	74.8	77.6	69.4	81.1	87.9	59.6	84.0	100.0	97.5	100.0	100.0	74.9

Tableau 4 - Relation entre le recrutement et le reste du stock du turbot de la mer Noire par cohortes, estimée par la méthode rétrospective

Cohorte	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Recrutement (%)	57,8	58,5	49,7	47,2	47,2	51,1	55,8	58,3	57,6	57,5
Reste (%)	42,2	41,5	50,3	52,8	52,8	48,9	44,2	41,7	42,4	42,5
Stock reproducteur (millions)	327,0	245,9	319,9	336,5	326,2	350,7	309,6	336,6	388,1	213,4

Cohorte	1963	1964	1965	1966	1967	1968	1969	1970	En moyenne
Recrutement (%)	60,1	56,9	53,3	48,3	50,0	46,8	50,9	51,1	53,2
Reste (%)	39,9	43,1	46,7	51,7	50,0	53,2	49,1	48,9	46,8
Stock reproducteur (millions)	179,4	221,2	241,8	303,4	281,6	226,0	290,4	382,5	293,3

Tableau 5 - Relation entre le recrutement et le reste du stock reproducteur du turbot de la mer Noire par année, estimée par la méthode rétrospective

Année	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Moyenne
Recrutement (%)	57,4	62,4	61,1	62,2	45,1	54,6	57,5	37,7	63,8	47,8	40,6	62,5	56,1	48,8	72,2	55,3
Reste (%)	42,6	37,6	38,9	37,8	54,9	45,4	42,5	62,3	36,2	52,2	59,4	37,5	43,9	51,2	27,8	44,7
Stock reproducteur (millions d'individus)	274,7	362,8	300,6	284,6	258,3	302,0	444,1	358,1	407,7	317,7	258,3	245,6	227,5	174,6	297,3	300,0

Tableau 6 - Données supplémentaires - Distribution d'âge des prises de turbot en 1974-1975

	Age									Nombre d'individus	Longueur moyenne
	2	3	4	5	6	7	8	9	10		
janvier 1974 - chalut	4,83	15,24	55,02	12,64	4,09	6,69	0,75	0,37	0,37	269	49,01
janv.-fév. 1974 - chalut	4,06	17,24	62,85	11,15	2,03	2,37	0,30	-	-	296	49,12
avril 1974 - filet maillant	2,55	10,69	52,79	15,95	8,30	5,42	2,23	1,75	0,32	627	52,11
février 1975 - chalut	1,29	9,72	53,72	18,12	7,12	8,74	1,29	-	-	309	52,61
avril 1975 - filet maillant	-	4,30	48,83	27,34	15,23	2,34	1,96	-	-	256	53,95

Tableau 7 - Données supplémentaires - Distribution de longueur des prises de turbot en 1974-1976

	Longueur (cm)										Nombre d'individus	Longueur moyenne
	35	40	45	50	55	60	65	70	75	80		
janvier 1974 - chalut	1,49	6,69	22,31	42,38	13,38	9,29	3,72	0,74			269	49,01
janv.-fév. 1974 - chalut	1,35	5,07	26,36	47,97	15,54	3,04	0,67				296	49,12
avril 1974 - filet maillant	0,16	2,87	18,82	40,35	20,89	8,77	4,15	2,87	0,64	0,48	627	52,11
février 1975 - chalut		2,91	10,68	38,84	30,42	12,95	4,21				309	52,61
avril 1975 - filet maillant	0,39	7,81	32,42	39,46	12,11	6,64	1,17				256	53,95
mai 1976 - filet maillant		4,0	15,3	32,5	34,3	11,3	2,2	0,4			223	52,21

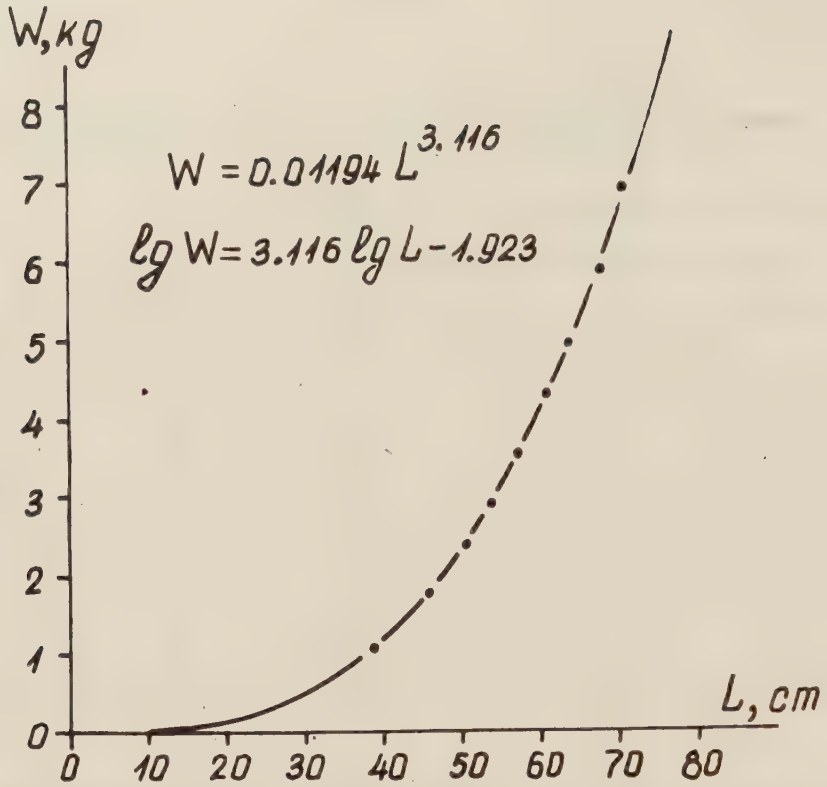

Fig. 1 Relation entre la longueur totale (L_{cm}) et le poids (W_g) du turbot

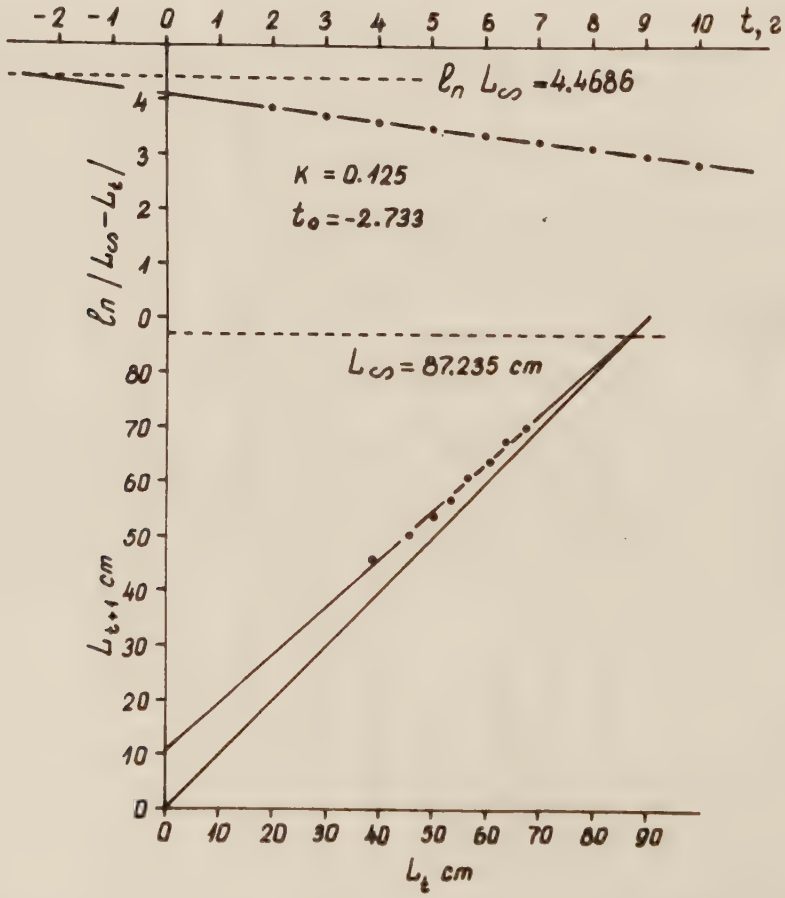

Fig. 2 Détermination graphique des paramètres de croissance en longueur du turbot de la mer Noire

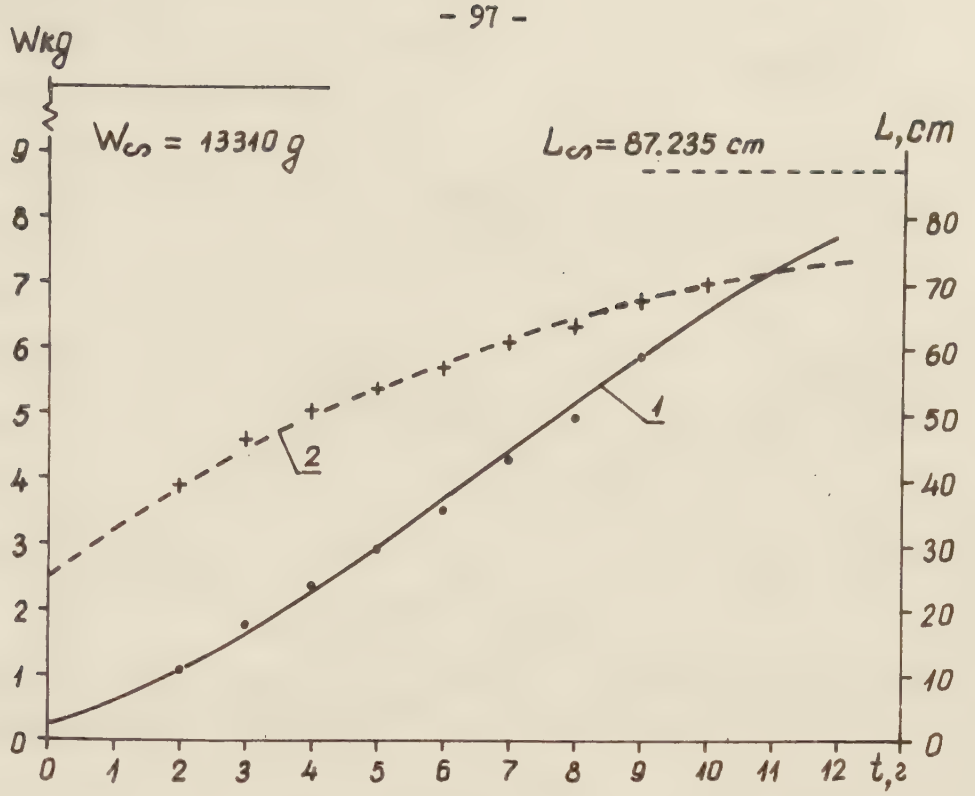

Fig. 3 Croissance en poids (1) et en longueur du turbot de la mer Noire

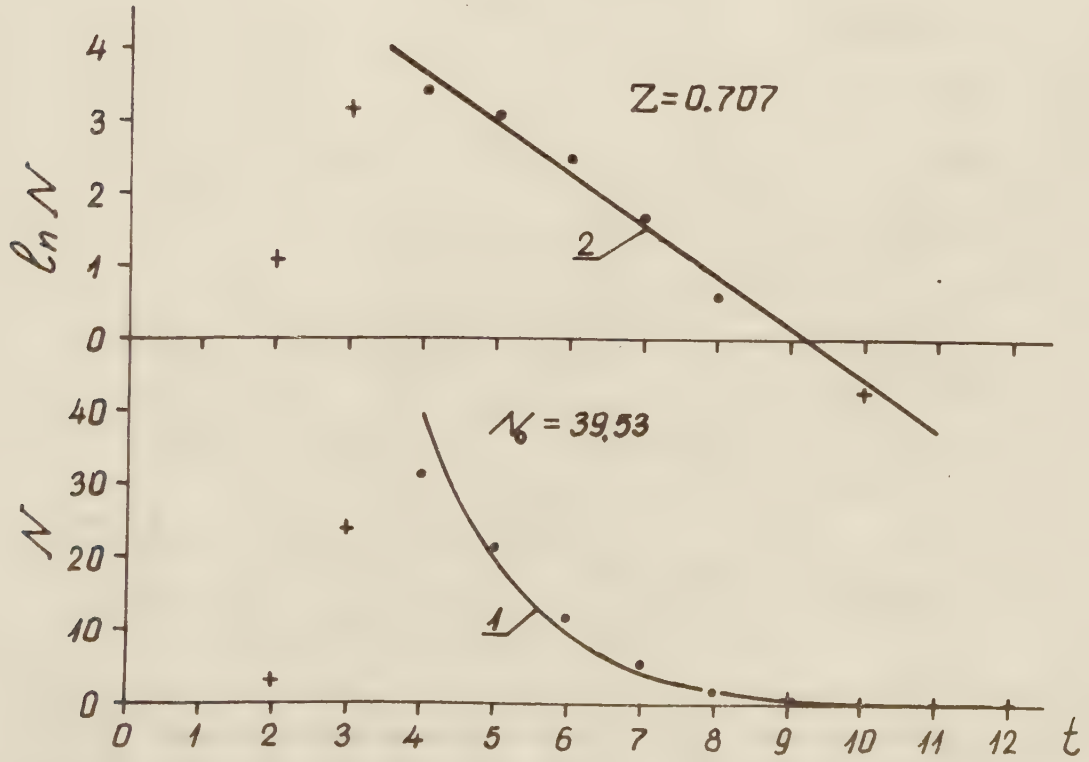

Fig. 4 Estimation de Z moyen à partir des indices d'abondance moyenne (effectifs) en fonction de l'âge et pour la période 1960-1975

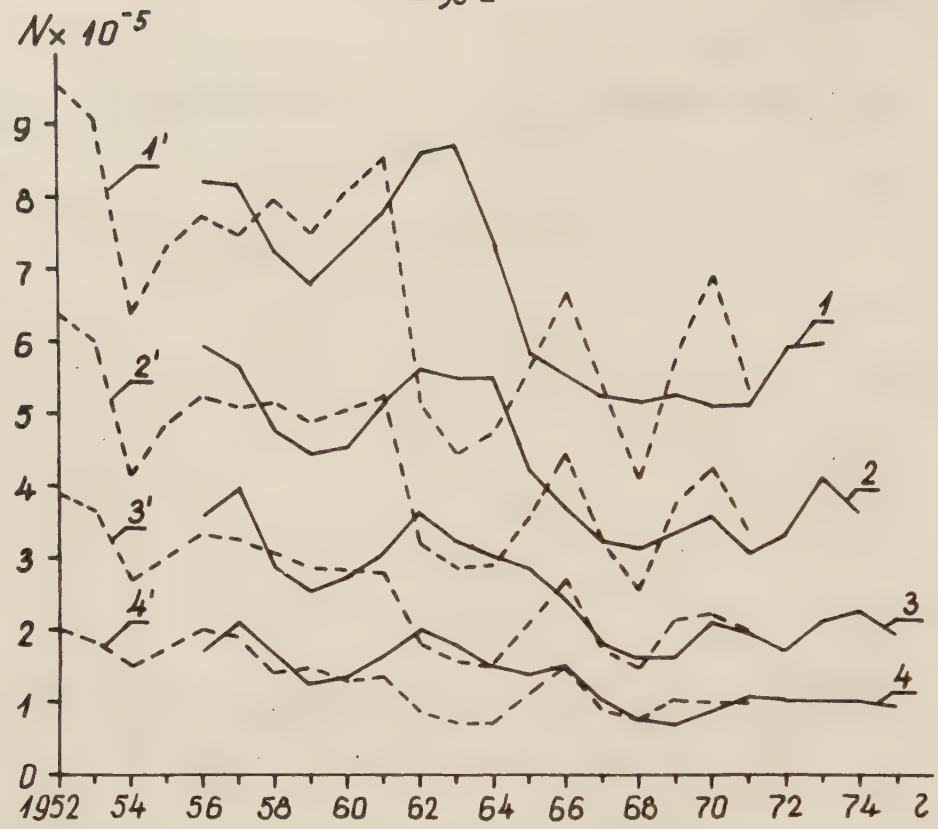

Fig. 5 Effectifs des cohortes du turbot par année calculés au moyen de la méthode des populations virtuelles

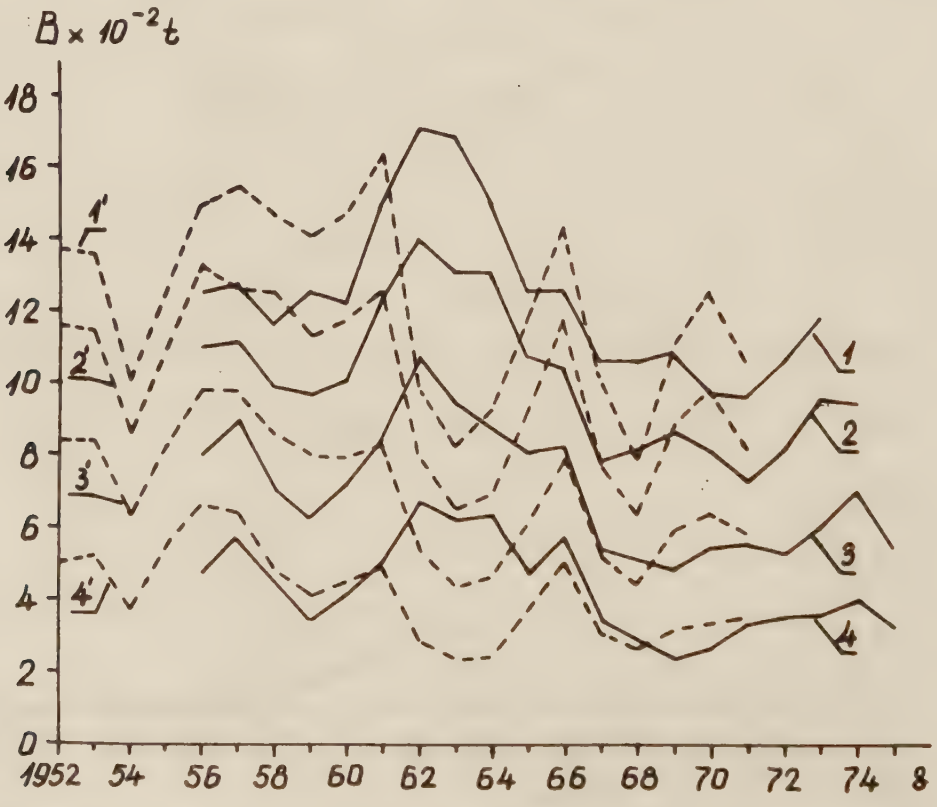

Fig. 6 Biomasse du stock du turbot par année et cohortes calculée par la méthode des populations virtuelles

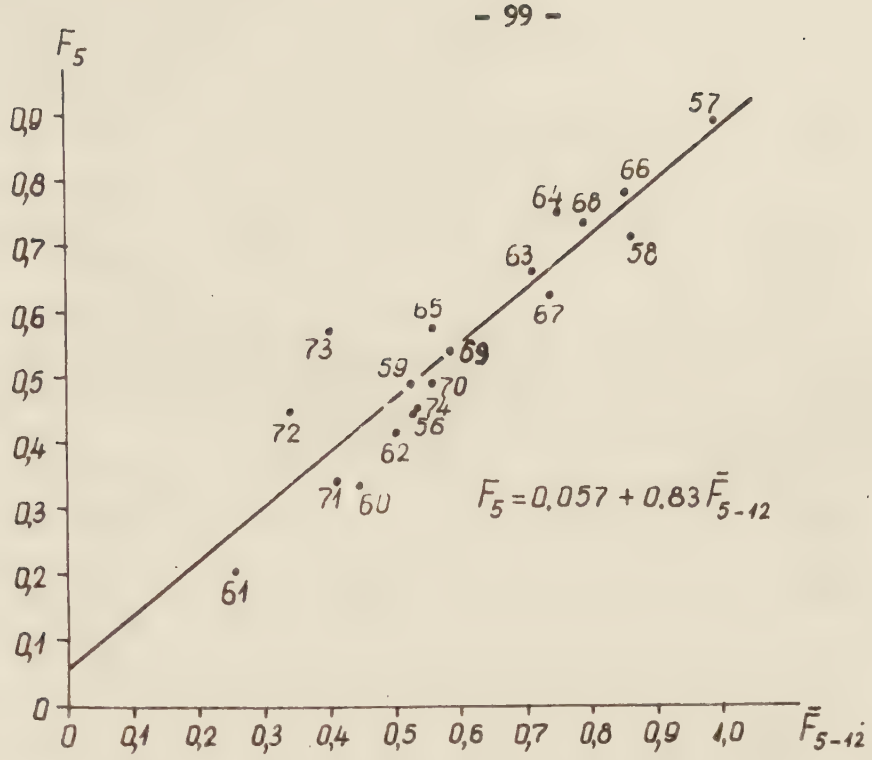

Fig. 7 Relation entre F_{5-12} et F_5 sur la période 1956-1974

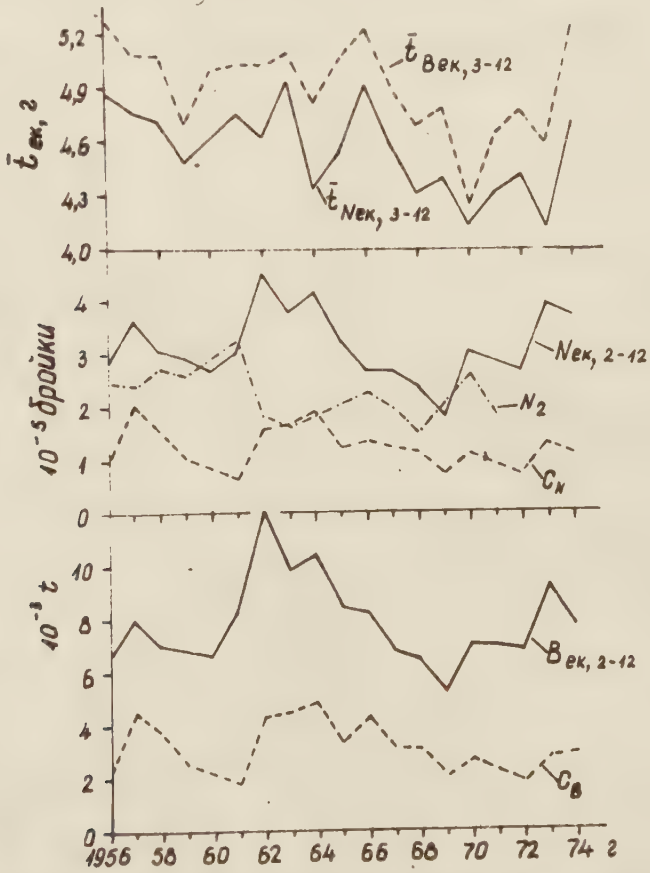

Fig. 8 Stock exploité en poids ($B_{ex,\ 2-12}$) et en nombre ($N_{ex,\ 2-12}$), prise en poids (C_B) et en nombre (C_N), âge moyen des stocks exploités pondéré en fonction des effectifs ($\bar{t}_{N_{ex,\ 2-12}}$) et des biomasses ($\bar{t}_{B_{ex,\ 2-12}}$) et effectifs de la cohorte à l'âge de 2 ans (N_2)

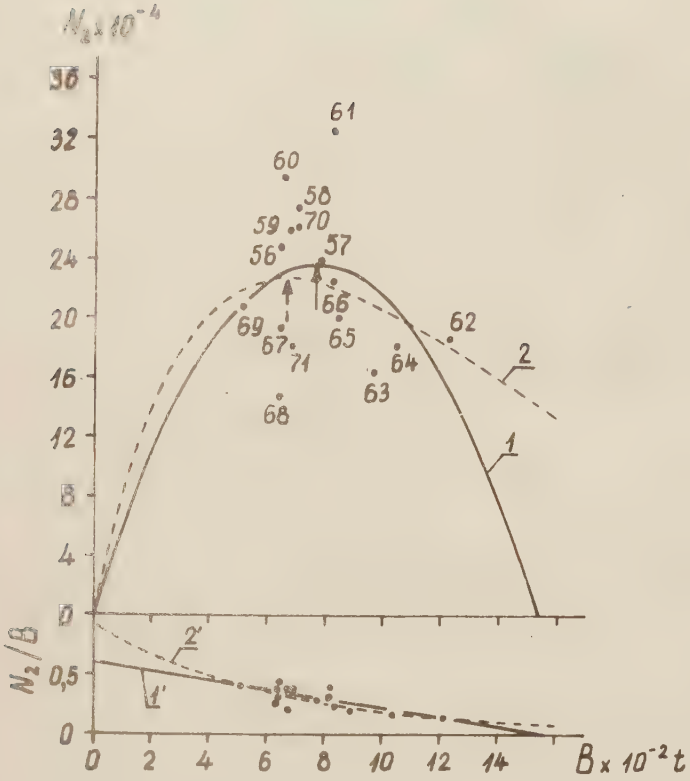

Fig. 9 Relation entre la biomasse du stock de reproducteurs au début de l'année (B) et effectifs des recrues à l'âge de 2 ans (N_2)

1 et 1': équation (9), (9.1)

2 et 2': équation (10), (10.1)

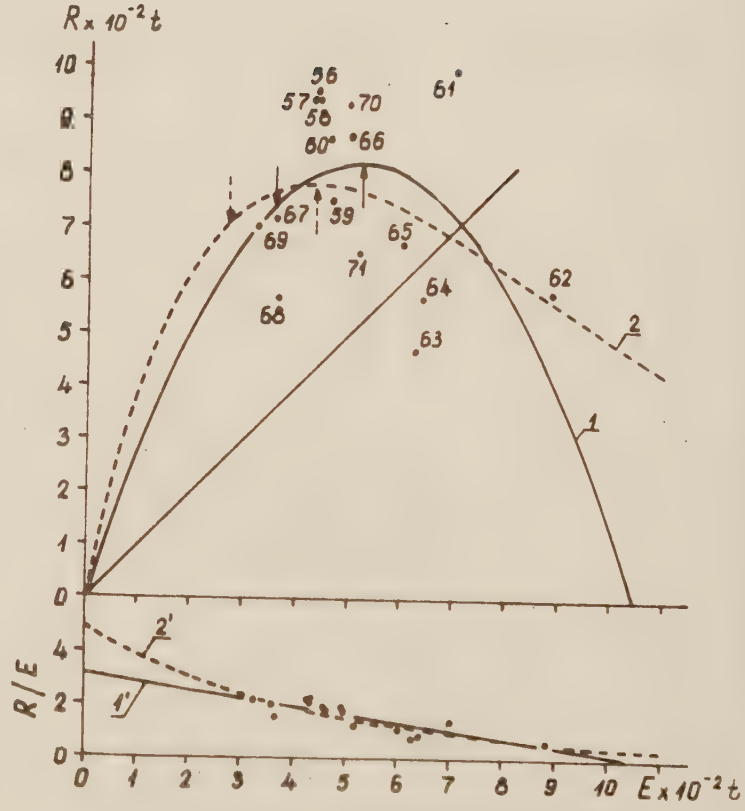

Fig. 10 Relation entre la biomasse parentale pendant la période de ponte (E) et la biomasse de la cohorte en phase de maturité sexuelle au début de l'année (R)

1 et 1': équation (9), (9.1)

2 et 2': équation (10), (10.1)

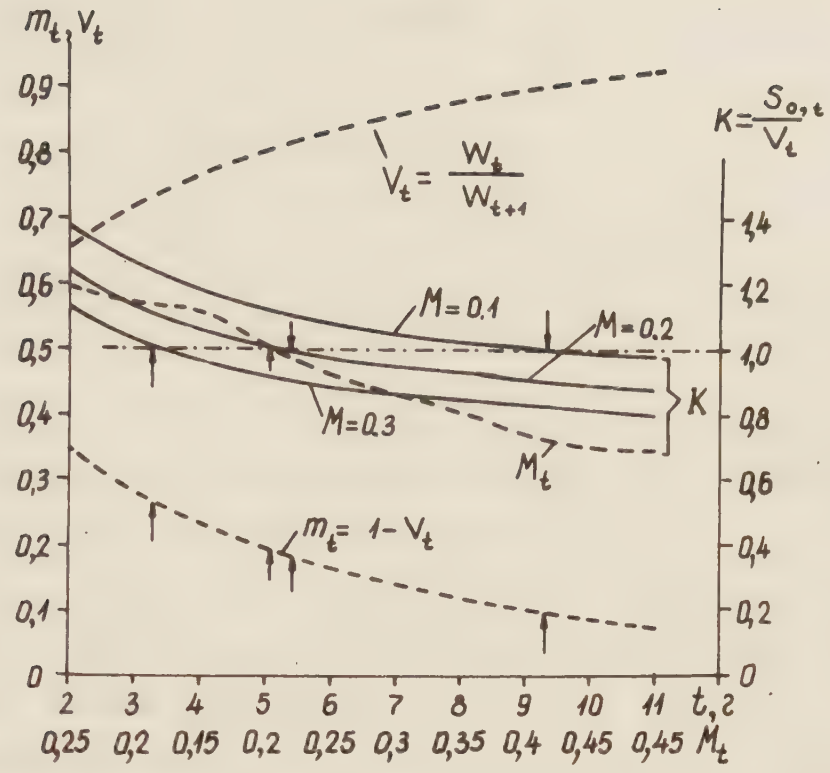

Fig. 11 Variations de m_t, v_t et du critère K_t en fonction de l'âge pour diverses valeurs de M

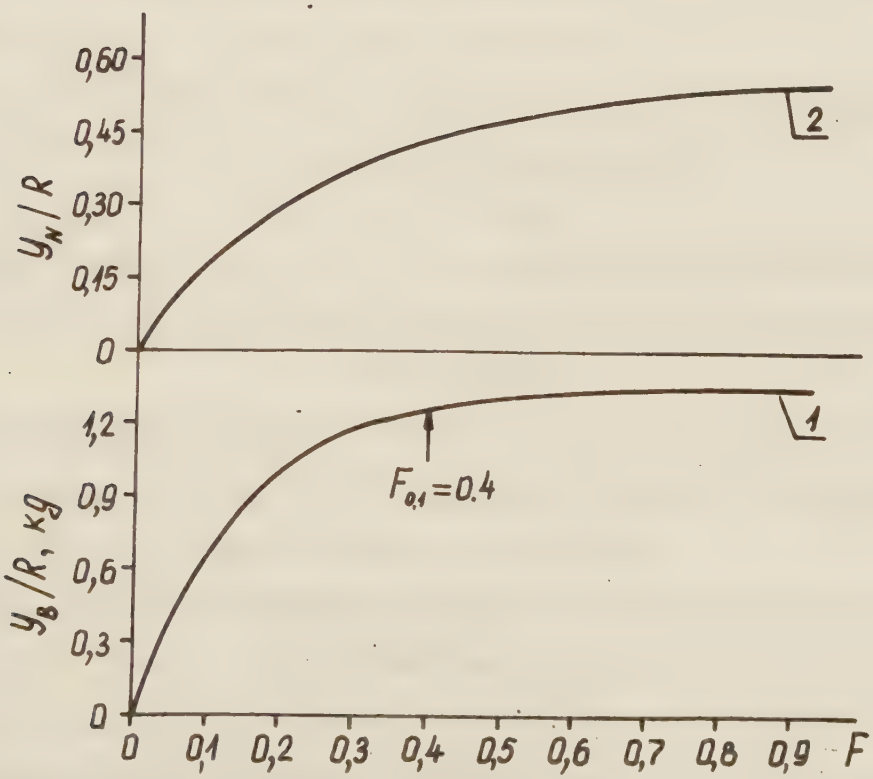

Fig. 12 Production (Y) en fonction du recrutement (R) en poids (1) et en nombre (2)

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ON THE REPRODUCTION CYCLES OF THE BLACK SEA SPRAT AND THEIR CONTROL

by

Stephan Stoyanov
Institute of Fisheries
Varna, Bulgaria

1. The periodicity in the abundance of the Black Sea sprat was first established in the years 1945-1949 and 1955-1959, indicated as "first" and "second" abundance cycles (Stoyanov, 1960). Later on, we discovered regular dome-shaped succession by years and the correlation points confirmed again this periodicity in the reproduction of the species (Stoyanov, 1965, 1966). Meantime, it was established also that the above periodicity shows a high degree of curvilinear dependence of the variations of the solar activity. So, for the 1945-75 period, the correlation ratio (η) between the year-classes' strength values and the Wolff's relative figure for the year of hatching equals to 0.86, and, the "peculiar" 1950 excluded, reach 0.95. High for the period (the 1950 always excluded) is also the correlation ratio between the annual catch and the Wolff's figure for the previous year, namely 0.89, the reliability of the relationship $t_\eta = 9.4$ 3.8 being considerably higher and surpassing the confidence limit of 0.999.

2. Fig. 1 shows the distribution of the correlation points stock/recruitment for the 1945-75 period derived from trap-net catches off the Bulgarian Black Sea coast during the winter and spring months when the age-groups are fully represented in the stocks fished. The correlation points indicated by triangles relate to the numbers of specimens (individuals) in the above catches, expressed in egg production, and those indicated by points relate to biomass or live weight. It should be noted that the trap-nets which operated in this season since the 1945, and also after the introduction of the trawl-net fishery of the species in 1970, remained quantitatively and constructively practically unchanged and, consequently, their catches can be assumed to be equal with the fishing effort and, therefore, fully comparable in assessing the state of the stocks of the species. The processing of the catch data by ages was made on basis of the examination of 857 samples from this period, consisting in total of over 176 000 specimens.

3. Over the Fig. 1 is delineated, for comparison, also the reproduction curve A, derived from the data for the strongest cycle (1954-58) according to the Ricker's equation: $Z = We^{a(I-w)}$ (cf. Ricker, 1958). The correlation points for this period, as can be seen in the Figure, are well away from the curve in question and, therefore, the above equation could not be used in determining the size of the most likely expectable recruitment. For this purpose, it seems more appropriate the trigonometrical equation of periodical function type:

$$y = a + b \cdot \sin\left(\frac{360}{r} \cdot x\right) + \cos\left(\frac{360}{r} \cdot x\right),$$

which was applied to the solar activity data, expressed with mean annual values of Wolff's figure (W), the virtual stock biomass (S) and the sprat catches during the winter-and-spring season (C) whose curves for the 1945-1975 period, as shown in Fig. 2, are very similar to one another.

4. The great scattering of the correlation points (Fig. 1) could not as much be attributed to deviations in the distribution (behaviour) or the age-groups in the coastal areas during the fishing season as related to the prevailing hydrometeorological conditions, or to causes of methodical and subjective nature, as to the overlapping of an entire series of cycles having different amplitude and duration time. In fact, the reproduction curves are not so monotypic as they are outlined in Fig. 1. The differences are particularly large when the curves are compared from before- and after the Sixties. The established extension of the survival curve in the last 15-20 years along with the observed extension of the size ranges

in the samples and the apparition in these of 4- and 5-year old fishes which were not occurring earlier, is to be related not so much to the well known feeble rising of the mean annual temperature of the surface layers (Varna Bay) in the second time-space (13.88°C instead of 13.76°C for the 1933-1959) but to the observed in the last 15-20 years considerable reduction of the stocks of the main sprat consumers in the Black Sea basin, i.e. the dolphins.

5. It was also observed that the reproduction cycles, in particular the most evidently outlined, and which are supposed to originate with the appearance of 2 or 3 successive very strong year-classes, were always preceeded by one or more severe winters (Stoyanov, 1960, 1965, 1966). These, unfavourably influencing the survival, cause a great reduction of the stock, resulting in an increased probability that a strong recruitment appeared. On the contrary, the mild winters which prevailed in recent years have caused the long lasting keeping up of the stock at a moderately high level; thence, the year-classes' strength for long fluctuated around an equilibrium state of an average scale, the cycle 1968-1971 excluded.

6. Simultaneously, the intensified upwelling of the Black Sea waters in severe winters which is strictly connected with an intensive pull out of nutrients on the surface enlarges the thickness of the cold underlying layer (Gololobov, 1961, 1964) in which sprat lives during a great part of the year. The thickness of this layer gradually decreases in the subsequent years, characterized by milder winters, and, at the same time shortens also the rich feeding base of our species. In the Black Sea this process has different continuance: from 2-3 to 5-6 years. The observations and the correlative comparisons show that the severe winters are in close relationship with the extrema of the 10-11 year periodicity of the solar activity (Eigensson, 1963; Roubashev, 1964; Girs, 1971; Mustel, 1971, and others).

7. The reproduction cycles are therefore dependent on the full utilization of the rich feeding base of the species, formed after severe winters, and which follows the well known sigmoid curve derived from the Verhulst's equation:

$$y = \frac{A}{1 + 10^{a+bx}} + C$$

8. In Fig. 3 the logistic curves of the full growth of the biomass are plotted for the sprat during the so called "first" and "second" cycle of abundance (Stoyanov, 1960, 1965), and whose origin coincides with the beginning of the 10-year periods of solar activity, numbered 18 and 19 respectively. On the same graph, indicated by a dotted line, is shown the full saturation of the system which is obtained by application of the Verhulst's equation to the data about the cycles in question and by balancing the corresponding regression ranges, whose empirical sizes are correspondingly indicated with crosses and circles. Under these, the mean surplus production is indicated for the two cycles (curves 3 and 4). Therefore, it appears that the surplus production of the biomass changed its proportionality from direct to inverse after throwing over the point at which the logistic curve changes its direction. It should be noted also that the cycles stop well before the so called "system's saturation" has been reached.

9. From the example, illustrated in Fig. 3, it appears that the surplus production in biomass, which is closely related with such concepts as "maximum equilibrium catch" and/or "maximum sustainable yield" (Graham, 1939; Gulland, 1968, and others) represents a highly variable magnitude in the time, which should be determined for each cycle separately. It can be seen also from Fig. 1 which indicates that since the reproduction of the species takes place at different levels during each cycle, the observation of the surplus produoction should be carried out for the single cycle. This imposes also another approach to the plotting of the reproduction curves. The relation of the correlative points stock/recruitment to a selected equation should be made so that attention could be paid to the outlining cycles because they differ from each other by amplitude, duration in time etc., and, consequently, by situation of the equilibrium locus. In fact, it often happens that if a given population density satisfies for a maximum reproduction in one of the cycles, the same parent stock size could be insufficient to produce equal recruitment or surpass the limit at which the probability of appearance of weak year-classes increases and the so-called "

"feed-backs" become active. Therefore, these phenomena seem to make the practical value of the above concepts very deceptive and, generally so, the results of our efforts to define the so called "steady state" of the stock.

10. The mode so far in use in collegating the correlation points stock/recruitment during the data processing by the method of the sum of the least squares for all the years without respect to their consecution (Ricker, 1954) does not offer possibilities to discover the basic peculiarity of the reproduction, i.e. its cyclicity. This, as shown by the multiple correlation functions, established on basis of numerous comparisons of the annual and seasonal values of a series of hydrometeorologic and biotic factors, reflects a similar periodicity also in the climatic fluctuations which are, in one way or another, controlled by the periodic variations in the solar activity. But this imposes attention to be paid to the phase in which the activity is itself and, thence to the stage of the periodic changes in the climatic factors, more exactly to their combined effect on the productivity of the Black Sea basin and on the survival of the single year-classes during the species reproduction timespace when the abundance of these year-classes is forming. Therefore, in practice, the problem of establishing the equilibrium yield from a given commercially exploited stock complicates greatly and it is difficult, at times impossible, to be solved.

11. In conclusion, the population dynamics of the Black Sea sprat is characterised by reproduction cycles having different amplitudes and duration and whose control by the 11-year periodicity in the solar activity is exercised by means of the so-called "mechanism of the severe winters".

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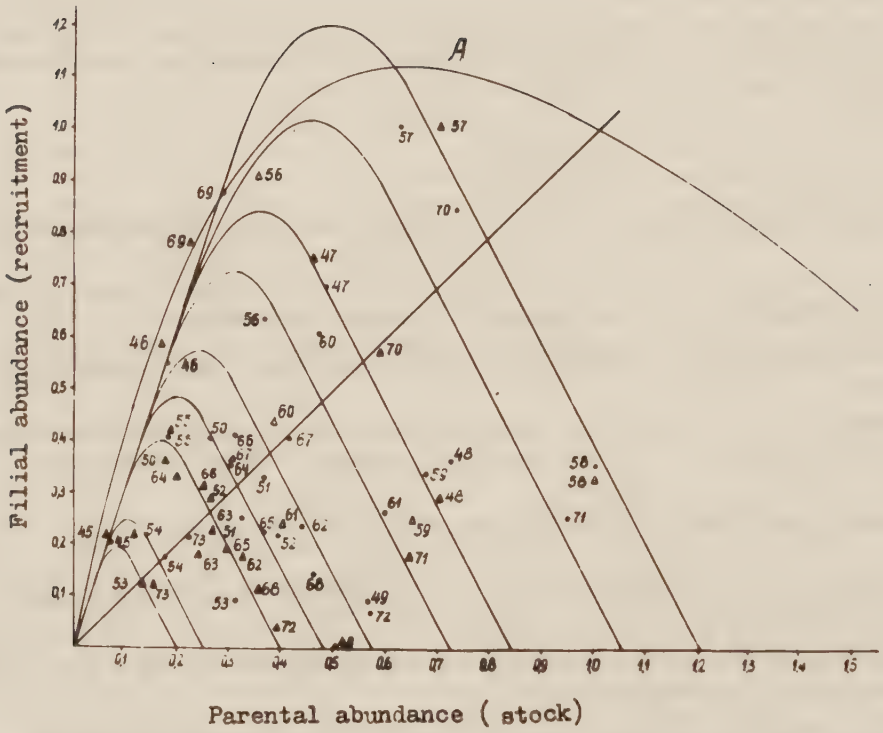

Fig. 1 Distribution of the correlation points stock/recruitment, expressed as egg production (Δ Δ Δ) and as biomass (....) in the Black Sea sprat based on the virtual population analyses of the Bulgarian catches for 1945–1975.
A – Reproduction curve plotted for comparison from the Ricker's equation

$$Z = We^{a(t-w)}$$

based on data for the strongest cycle (1955–1959)

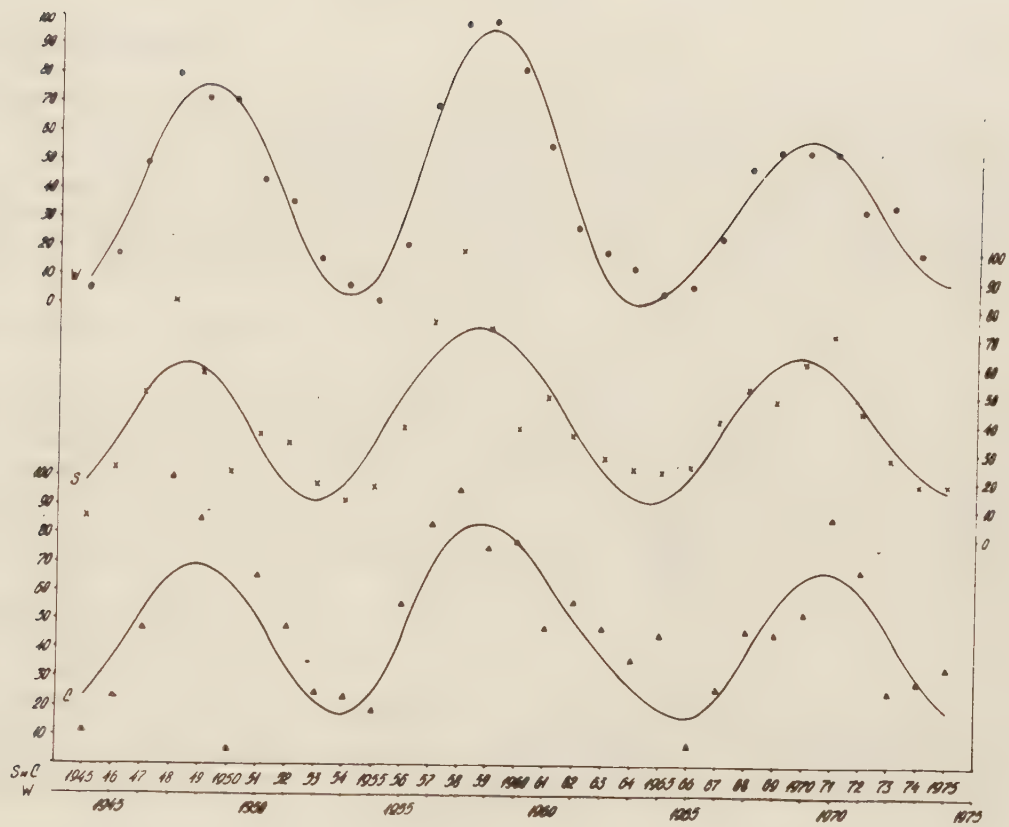

Fig. 2 Mean curves as plotted by using the trigonometric equation of the periodical function

$$y = a + b \cdot \sin\left(\frac{360}{r} \cdot x\right) + \cos\left(\frac{360}{r} \cdot x\right)$$

based on empirical data about the solar activity, as measured by Wolff's figure, W = (ooo), the virtual biomass of the Black Sea sprat, S = (+++), and the catch of the species in the winter and spring months off the Bulgarian coast, C = (△△△)

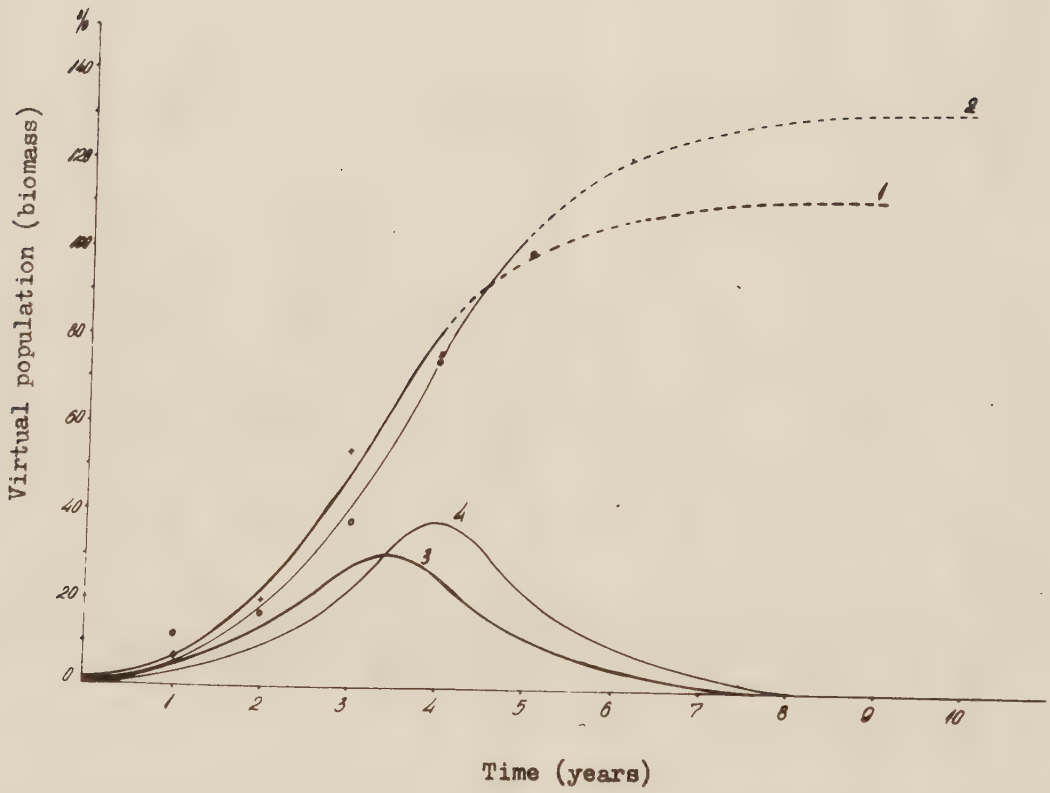

Fig. 3 Plotting of the logistic curves 1 and 2 by using the Verhulst's equation under the form of $y = \frac{A}{1 + 10^{a+bx}} + C$ for the biomass growth of the Black Sea sprat based on data for the catches off the Bulgarian coast during the so called "first" (+++) and "second" (ooo) abundance cycles. 3 and 4 are the mean curves of surplus production for the same cycles respectively.

CYPRUS - NATIONAL RESEARCH REPORT

by

A. Demetropoulos
Fisheries Department
Nicosia, Cyprus

1. Mesh size regulations

(a) Measurements of mesh size are currently undertaken in an ad hoc manner on commercial trawlers. The findings are inconclusive due to the vagueness of the present legislative provisions in as much as law enforcement is concerned. Measurements with an ICES gauge point out to a general uniformity of mesh sizes in the cod-ends used. The readings are more or less consistently 34 mm at a pressure of 4 kg. New regulations have been prepared under the Fisheries Law and should be enforced in the near future. These provide for the use of ICES gauge and the method of measurement recommended by GFCM.

(b) A formal answer has already been given on this point. This is:

"That the Cyprus trawl fishery is dependent to a large degree on the fish Meana smaris. This fish is too small to be retained by the 40 mm mesh recommended by GFCM and though we are aware of the damage to other fish species by the use of smaller mesh nets we find ourselves reluctant to increase our present mesh size regulations which foresee the use of 32 mm mesh size nets without further research into the matter. This kind of research which will be centred inter alia on the selectivity of cod-end mesh size on M. smaris is currently being planned and will start early in 1978 with the arrival of cod-ends of a variety of mesh sizes.

M. smaris currently forms about 50 percent of the Cyprus trawl fishery production in terms of weight and 35 percent in terms of value.

We are taking the necessary measures for the introduction into our fisheries legislation of the use of the ICES gauge as a means of measuring mesh size. The method of measurement of the mesh size of cod-ends recommended by the GFCM is also to be introduced. It is expected that these measures will be enforced by the end of 1977."

2. National grid

We face no problems. A good data breakdown is available.

3. Catch statistics

We face no problems.

4. Effort statistics and cpue

Satisfactory effort statistics and cpue are collected and are available in the Department's Annual Report. Form statland 37 B has been completed for years 1972 - 1976. No "special forms" have been received by this Department.

5. Routine biological sampling

Main species sampled

- Mullus barbatus
- Mullus surmuletus
- Maena smaris
- Boops boops

Landing ports: all fishing stations where inshore boats land their catch (about 10)

Amount of sampling: about 50-100 fish/month/port/species.

6. Particular investigations

No particular investigations have been carried out since 1975, except on swordfish fisheries, in which case preliminar information and data on length/weight parameters, feeding habits, gonad maturity, sex, etc. were collected. The following surveys are programmed for 1978-1979:

(a) Trawling survey for the determination of the spawning seasons and spawning grounds of fish;

(b) Trawling survey for the assessment of M. smaris resources;

(c) Trawling survey for the estimation of the new year-classes recruitment;

(d) Mesh-size selectivity experiments for cod-ends for M. smaris in particular;

(e) Exploratory fishing for locating stocks of swordfish and other pelagic species:

(i) Longlining at several depths, areas and seasons with the use of different sizes of hooks;

(ii) Light attraction methods;

(iii) Preliminary echosounding surveys on squids and other species;

(f) Deep water long lining.

7. Strengthening national structures and mechanisms for stock monitoring

All such work is carried out by the Department of Fisheries and there have been no recent changes.

The present coverage is considered satisfactory. Improvements are currently being effected in the biological sampling programmes of the Department in monitoring in a better manner trawl catches.

Upon landing, statistics are collected on weight by species, (category) and effort of trawl, inshore and swordfish fisheries. In the case of swordfish and sharks the number of fish is also recorded. Statistics are collected for all landing ports separately. For the trawl and swordfish fisheries, all vessels supply statistics. For the inshore fishery, statistics are collected on a sample basis.

The Department covers research aspects and statistical compilations.

There are no working arrangements between Cypriot and other scientists.

8. Publication

Annual Report on the Cyprus Fisheries.

A SUMMARY REPORT ON THE ROUTINE SAMPLING PROGRAMME FOR SARDINE AND ANCHOVY IN THE ADRIATIC

by

D. Levi
Laboratorio di Tecnologia della Pesca - CNR
Ancona, Italy

I. INTRODUCTION

1. Pelagic fisheries for sardine and anchovy underwent a great development in the post-war period, especially in the northern Adriatic Sea, where the light seiners of Chioggia (near Venice) reached 80 in 1958 (Mozzi, 1963). Ever since, the seiners have gradually been replaced by the paired trawlers towing the so-called "volante" which is a local modification of the Larssen net.

2. A general improvement of living conditions in the sixties has greatly influenced the trend of fish demand towards more priced demersal species. In addition, there has been the obvious parallel increase of the cost of labour force, and a rather low rate of utilization of light-seiners, have progressively reduced the importance of the fisheries for clupeids in the Adriatic Sea.

3. A change in this trend was noticed in the early seventies, mostly due to a great effort produced by some cooperative organizations to find both new and better market outlets (namely exports to Spain and France) and some cuts in production costs. It is worth mentioning that it was first the "A.P.P.A.M.A." (small pelagic fish producers' association of the high and middle Adriatic Sea) to stimulate in 1972 a joint research programme between the Zoology Institute of the University of Trieste, the University Centre for Studies and Research on Marine Biological Resources of Cesenatico (University of Bologna), the Hydrobiological Station of Chioggia (University of Padua), the Laboratory of Marine Biology and Fisheries of Fano (University of Bologna) and the Laboratory for Fisheries Technology of Ancona (National Research Council).

4. The three-year programme was designed to give answers to the following questions:

(a) Migratory routes and their causes;
(b) Causes of the different distribution area of "small" and "big" anchovies;
(c) Assessment of the stock of anchovies in the high and middle Adriatic Sea;
(d) Effects of the catch of "small" anchovies on the stock and on future yields.

5. Although the programme never started because of lack of financing, its origin does demonstrate a genuine interest by large sectors of industry people in such questions. The objective need for a vast programme directed to the knowledge of populations dynamics and to the monitoring of the fisheries has become more and more evident in recent years. About six billion Italian liras have been spent by the Italian Government in the last three years to advertise mass consumption of fresh sardines and anchovies, some fishermen cooperatives themselves are pushing hard to promote the product through agreements with municipalities of big towns and with dealers associations, a number of transformation industries are being planned or actually built. The emphasis put into the development of pelagic fisheries in Italy during recent years, is at least partly the result of analysis and of the main findings of the GFCM about the general impossibility of carrying further the development of demersal fisheries.

6. Besides the abovesaid development factors, there are some EEC market regulations (100/76 etc.), which tend to encourage indiscriminate fishing for fish meal. It is therefore easy to predict a likely rapid increase of Italian fishing effort on clupeids in the Adriatic

Sea. Already Yugoslavia has planned the growth of its pelagic fleet in the next five years. This explains the great interest of Italian research institutes in this field. Three programmes, as far as we know, are at present being implemented: egg and larvae survey (Piccinetti, Fano), echo-survey (Azzali, Ancona) and the following one.

II. THE PROGRAMME

7. In view of the wide scope of the programme, it was decided to start gradually and proceed step by step rather than planning a long preparatory phase. The programme thus started from Ancona, and then spread to cover the main landing points further north. We are now working to cover the landing points to the south of Ancona, down to the Gargano promontory. so that we plan to have the whole "most likely distribution area" of the stocks covered by the end of 1978.

8. In each of the main ports a "correspondent" of the Laboratory has the responsibility of recording the commercial statistics, and fish samples which are then labelled and kept frozen until they are monthly collected by people of the Laboratory.

9. Commercial statistic data (and not landings) by catch boat by day are collected. All fishing days are recorded whenever possible and all commercial categories (by size and species composition) are recorded and sampled weekly. The first year is always purposely oversampled and the lenght frequency distribution analysis is used to optimize the sampling rate. So as to have an unbiased sampling system, we try to minimize the monthly variance of the numbers of individuals of the central most frequent length classes in the given port. The hierarchy of the sampling scheme is not a simple one but it can be summarized as follows:

(a) landing points (= domains)
(b) stratification by "fishing technique" and/or by "commercial category"
(c) two-stage random sampling, with boats as p.s.u. (primary sampling units) and boxes as s.s.u. (secondary sampling units).

10. In the laboratory all individuals are measured to the nearest cm below and subsamples of 10-15 individuals for each length class are drawn for the fine length-weight measurements and ageing (by otoliths for anchovies, by otoliths and six scales per individual for sardines). We are planning to start fecundity studies next year.

11. All data are being stored in electronic files, after validation, numerical coding and local editing, and teletransmitted to the IBM 370/168 and/or the IBM 370/158 of the CNUCE (Pisa) by a terminal installed at the Laboratory in November 1977. Some delay in the choice of the EDP facilities has caused an accumulation of data which is now being gradually overcome, so that updating of the different files will be completed by mid-year. 1/ Data availability tables are attached in appendix.

III. CONCLUSIONS AND PERSPECTIVES

12. For the work covered so far, we consider the data flow and the coverage to be satisfactory. Nevertheless the system is weak in that sudden and unforseeable factors may easily endanger its regular running. All our efforts are thus being directed in expanding the system and making it more efficient and permanent.

1/ For a limited fraction of the fleets only (namely at Cesenatico for 5-10 fishing units and at Cattolica for the whole fleet) more detailed data on catch and corresponding effort (duration, location, etc.) are also available on log-books filled by interview.

13. The main difficulty lies in the fact that a research laboratory has to take charge not only of biological sampling, but also of routine commercial statistics. 1/ As there was no other choice at the time, it was decided to give priority to stocks of clupeids in view of their potential economic importance. We would also very much appreciate if a similar sampling programme could be started in Yugoslavia. In fact, we are convinced that the combined results of this work, together with echo and egg-larvae surveys, should lead to more sensible management strategies in the next couple of years. But the real danger nowadays is that the rapid and indiscriminate increase of fishing effort on clupeids encouraged by the EEC regulations ... "Common Market Policy" may destroy these resources in a much shorter time.

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1/ Our Laboratory has proposed a 2.5 year pilot study to assess the possibility of improving the national fisheries statistical system by changing from the present "total census" to a "sample survey" system. The project is under examination by the National Fisheries Association.

PROGRES REALISES AU PLAN NATIONAL ET ARMEMENT MAROCAIN EN MEDITERRANEE

par

J. Hamour-Tahra
Institut scientifique des pêches maritimes
Casablanca, Maroc

I. PROGRES REALISES AU PLAN NATIONAL

1. Identité et répartition des unités de stocks

Bien que le rapport de la 6ème session du Groupe de travail ait souligné que les lacunes dans ce domaine puissent avoir des conséquences néfastes sur l'évaluation des stocks pélagiques en mer d'Alboran, aucune nouvelle information n'a pu être rassemblée. Néanmoins, nous continuons à dénombrer les vertèbres des sardines (cf. 2ème partie).

2. Maillage des chaluts utilisés

Malgré la recommandation du Comité de l'aménagement des ressources du CGPM pour que les Etats membres prennent des mesures visant à l'interdiction d'usage de chaluts de maille (cul de chalut) inférieure à 40 mm, l'administration marocaine a rencontré de grandes difficultés pour appliquer cette recommandation. Aucune mesure n'a été alors prise par manque de gardes maritimes.

Théoriquement, la législation marocaine fixe le maillage des chaluts à 70 mm, chiffre basé sur une recommandation ancienne du COPACE.

Bien qu'aucune mesure de maillage des chaluts n'ai été faite, il découle de nos observations que le maillage pratiquement utilisé serait de l'ordre de 25 - 35 mm. Une étude de sélectivité des chaluts sera bientôt entreprise.

3. Réseau géographique pour la saisie des données d'origine commerciale

Notre réseau géographique pour la saisie des données halieutiques d'origine commerciale est relativement court. Celles-ci nous parviennent directement de notre annexe aux ports de débarquement et principalement Al Hoceima. Cependant, certaines quantités — faibles — des petits ports échappent encore aux statistiques.

Nous comptons dès cette année imposer des carnets de pêche et des cartes simplifiées à tous les bateaux de la zone. Ceci nous permettra de connaître les lieux de capture d'une manière plus précise.

4. Statistiques de capture

En général, l'emploi des listes d'espèces recommandées par le CGPM ne pose aucune difficulté. Cependant, les débarquements de certaines espèces très voisines sont comptabilisés sous le même nom, ce dont nous sommes conscients et que nous signalons chaque fois.

Il faut aussi noter que nous comptabilisons les statistiques de débarquement et non pas de capture. Nous n'avons, en effet, aucune information sur les rejets.

5. Statistiques d'effort et cpue

Le rassemblement des données d'effort n'a commencé qu'à partir de 1974 et uniquement à Al Hoceima, principal port marocain en Méditerranée.

Les composantes principales de l'effort retenues sont:

- le nombre de sorties en mer
- la jauge brute (pour les sardiniers)
- la puissance motrice (pour les chalutiers).

Nous ne relevons pas le temps effectif de pêche car les bateaux s'éloignent peu du port et ne passent pas plus d'une journée en mer: le temps de route est alors négligeable.

L'unité d'effort alors retenue pour les sardiniers est "le nombre de sorties x la jauge brute" ou "le nombre de sorties x la puissance motrice" pour les chalutiers. Un essai de détermination d'une unité d'effort de la pêche artisanale au chalut en Atlantique, d'ailleurs comparable à celle de la Méditerranée, nous a permis d'opter pour cette unité d'effort qui montre une meilleure corrélation (Brethes, 1977).

Cependant, l'utilisation généralisée du lamparo entraîne probablement une erreur dans l'estimation de l'effort des sardiniers. Nous n'avons en effet, aucune information sur le nombre de lampes ni sur leur puissance lumineuse.

6. Echantillonnage biologique

Depuis 1975, nous échantillonnons la sardine débarquée à Al Hoceima. Une distribution de fréquence de taille et une clé âge-longueur sont jointes à l'annexe 12.

Nous allons bientôt commencer l'échantillonnage d'autres espèces.

7. Campagnes de prospection

Deux campagnes de prospection acoustique ont été réalisées en Méditerranée (cf. annexe 12) et d'autres sont prévues pendant l'année 1978.

Cependant, nous n'envisageons pas encore de prospections au chalut en Méditerranée bien que notre programme de recherche en mer réserve une partie non négligeable à cette étude en Atlantique qui reste pour nous la zone prioritaire.

Il en est de même pour les prospections d'oeufs et de larves. De telles études ne seront étendues au secteur méditerranéen qu'en dernier lieu.

8. Renforcement des structures et des mécanismes nationaux pour la surveillance des stocks

Au sein de l'Institut scientifique des pêches maritimes du Maroc, les responsabilités sont actuellement réparties par stocks (pélagiques et démersaux) entre des chercheurs nationaux.

En ce qui concerne les relations entre instituts de pays différents intéressés par les mêmes stocks, nous sommes favorables à toute collaboration.

9. Publications

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- Lamboeuf, M. 2, 1974 Résultats de la prospection acoustique du Cap Milonia à la Pointe Stafford. Trav.Doc.I.S.P.M.:8

II. ETAT DE L'ARMEMENT MAROCAIN EN MEDITERRANEE A LA FIN DE 1977

10. La flottille de pêche marocaine en Méditerranée est essentiellement artisanale. Elle est constituée uniquement de bateaux qui pratiquent la pêche côtière. Ces bateaux de petite

taille et de faible rayon d'action, sont dépourvus de moyens de conservation à bord et sont gérés sur une base familiale. Leur dimension (jauge brute) et leur puissance ne dépassent guère 100 tonneaux (Tx) et 450 chevaux vapeur (ch). Les moyens de conservation à bord sont limités à la glace ou à la régrigération. Parfois ni l'une ni l'autre n'existent. Le rayon d'action est faible; les marées sont de 3 à 6 jours au maximum.

11. La flottille de pêche

La flottille de pêche se divise, comme partout au Maroc, en trois types de bateaux: les sardiniers qui sont en général des senneurs, les chalutiers et les palangriers qui pêchent à la palangre, au tramail, au filet droit, à la ligne à main et avec des casiers. Certains sont à la fois sardiniers et chalutiers ou sardiniers et palangriers.

(i) Les sardiniers

Ils sont répartis dans les quatre ports: Al Hoceima, Nador, M'diq et Martil.

Quelque remarques sur les sardiniers d'Al Hoceima:

- Leur nombre est en augmentation: de 21 en 1974 il est passé à 33 en 1977 soit un accroissement de 57 pour cent.

- Leur taille et leur puissance sont en augmentation. La jauge brute totale des sardiniers a subi la même évolution que leur nombre. Elle est passée de 939 Tx en 1974 à 1429 Tx en 1977, soit un accroissement de 52 pour cent. Leur jauge moyenne qui était de 44 Tx en 1974 est passée à 49 Tx en 1977, soit un accroissement de 11,4 pour cent. De même, la puissance moyenne qui était de 172 ch en 1974 est passée à 237 ch en 1977, soit un accroissement de 38 pour cent, et leur puissance totale s'est accrue de 3259 ch en 1974 à 7809 ch en 1977, soit un accroissement de 140 pour cent.

- Leur répartition montre une concentration dans le port d'Al Hoceima. Ainsi 57 pour cent des sardiniers marocains en Méditerranée pêchent près d'Al Hoceima. Cette tendance s'explique par l'absence d'une infrastructure portuaire dans les autres ports. Cependant, il est à noter que le port de Nador subit actuellement de grands changements en vue de son agrandissement. On verra, probablement, dans l'avenir, une partie de la flottille se déplacer vers ce port.

- Leur âge moyen a faiblement diminué. Il est passé de 12 ans en 1974 à 11 ans en 1977. Ceci est dû probablement à la construction, ces deux dernières années, de nouveaux sardiniers qui représentent 21 pour cent des sardiniers d'Al Hoceima.

- Conclusion: a côté de ce faible rajeunissement on constate une augmentation, en nombre, en dimension et en puissance de la flottille sardinière en Méditerranée avec une concentration au port d'Al Hoceima.

(ii) Les chalutiers

Ils sont répartis dans les deux ports: Al Hoceima et Nador. Comme pour les sardiniers, nous commentons l'évolution des seuls chalutiers d'Al Hoceima.

- Leur nombre a augmenté: de 6 en 1974, il est passé à 11 en 1977, soit un accroissement de 83 pour cent.

- Leur taille et leur puissance sont en augmentation: la jauge brute totale des chalutiers est passée de 156 Tx en 1974 à 345 Tx en 1977, soit un accroissement de 121 pour cent. Leur jauge moyenne de l'ordre de 26 Tx en 1974 était égale à 31,35 Tx en 1977, soit un accroissement de 21 pour cent. Leur puissance moyenne qui était de 125 ch en 1974 est passée à 160 ch

en 1977, soit un accroissement de 28 pour cent. De même, la puissance totale est passée de 875 ch en 1974 à 1745 ch en 1977, soit un accroissement de 99 pour cent.

- Ils sont répartis entre les deux ports: Al Hoceima groupe 41 pour cent des chalutiers. Le reste est à Nador.

- Leur âge moyen est en hausse. En effet, un seul chalutier a été construit en 1975. Ainsi leur âge qui était de 16 ans en 1974 est passé à 19 en 1977.

- Conclusion: malgré leur vieillissement, le nombre, la puissance et la jauge brute des chalutiers d'Al Hoceima ont tendance à augmenter. Ceci s'explique par l'achat de chalutiers d'occasion.

(iii) Les palangriers

Les palangriers sont répartis dans les cinq ports: Al Hoceima, Nador, M'diq, Martil et Oued Laou. On compte actuellement 126 palangriers plus ou moins dispersés dans les cinq ports, mais avec une légère concentration à Nador (44 pour cent des palangriers).

- Leur jauge brute moyenne est de l'ordre de 3,36 Tx. La jauge totale est de 423,71 Tx. Leur puissance moyenne ne dépasse guère 18 ch, et leur puissance totale est de 1305 ch. Il faut noter que 53 palangriers ne sont pas motorisés et se propulsent à la rame.

- Conclusion: malgré leur nombre relativement grand par rapport à celui des sardiniers et des chalutiers, les palangriers sont de faible puissance et jauge brute.

N.B.: Nous n'avons pas tenu compte d'un certain nombre faible de bateaux polyvalents qui sont à la fois chalutiers et sardiniers ou sardiniers et palangriers.

12. Engins de pêche utilisés

Les sardiniers sont tous des senneurs utilisant des sennes tournantes. Ils sont munis de power-block et pêchent tous aux lamparos. Ils ont la déplorable habitude d'utiliser la dynamite.

Les chalutiers utilisent des chaluts de type espagnol, dit "chaussette espagnole".

Quant aux palangriers, ils pêchent à la palangre, au tramail, au filet droit, à la ligne à main et avec des casiers.

13. Conclusion

Au cours de la période 1974 - 1977 l'armement marocain en Méditerranée qui est caractérisé par une activité côtière a subi de grandes transformations. Le nombre, la taille et la puissance des bateaux ont augmenté d'environ 50 pour cent.

EVOLUTION DE L'ARMEMENT MAROCAIN EN MEDITERRANEE: AL HOCEIMA DE 1974 A 1977

Bateaux	Année	Nombre	Jauge brute moyenne (Tx)	Jauge brute totale (Tx)	Puissance moyenne (ch)	Puissance totale (ch)
Sardiniers	1974	21	47	939	172	3 259
	1977	33	49	1 429	237	7 809
	accrois-sement	57 %	11,4%	52 %	38 %	140 %
Chalutiers	1974	6	26	156	125	875
	1977	11	31	345	160	1 745
	accrois-sement	83 %	21 %	121 %	28 %	99 %

EFFORT DE PECHE: AL HOCEIMA

Années	Sardiniers			Chalutiers		
	Nombre de sorties total	Jauge moyenne (Tx)	Effort de pêche (jauge x nombre de sorties)	Nombre de sorties total	Puissance moyenne (ch)	Effort de pêche (puissance x nombre de sorties)
1974	3 657	44,70	163 451	649	125	74 920
1975	3 555	47,60	169 427	800	116	101 104
1976	3 548	45,03	178 939	1 233	174	169 909
1977	4 575	49,29	228 525	1 262	158	202 815

DONNEES DISPONIBLES SUR LES POISSONS PELAGIQUES DE LA COTE NORD MAROCAINE

par

R. Biaz et M. Rami
Institut scientifique des pêches maritimes
Casablanca, Maroc

1. Les principales espèces pélagiques capturées dans la sous-zone CGPM 37.1 sont: la sardine (Sardina pilchardus), l'anchois (Engraulis encrasicolus), le maquereau (Scomber sp.), le chinchard (Trachurus trachurus) et l'allache (Sardinella aurita). La sardine représente l'espèce la plus abondante.

Distribution géographique

2. Les données disponibles résultent de deux campagnes de prospection acoustique:

a) Campagne du 15 novembre au 9 décembre 1973 (Villegas, 1973)

Pendant cette campagne les espèces prédominantes étaient la sardine et le chinchard. La sardine a été rencontrée dans les zones côtières, principalement sur l'isobathe 60 m, alors que le chinchard se trouvait dans les eaux plus profondes entre 50 et 110 m. Les concentrations de sardine étaient présentes entre Saïdia et Melilla, autour de la pointe Betoya, autour d'Al Hoceima et Cabo negro (voir carte 1). La sardine débarquée dans le port d'Al Hoceima, à cette époque, avait une longueur modale de 16,5 cm. A l'est de Melilla, des concentrations très denses de chinchard ont été rencontrées. Ces concentrations étaient composées de petits chinchards ayant une longueur modale de 13,5 cm. Des concentrations d'anchois ont été repérées au large de Saïdia, et des anchois ont été pêchés mélangés à la sardine près des îles Zafarines.

b) Campagne du 5 au 26 février 1974

Lors de cette campagne aucune concentration d'anchois n'a été détectée. La sardine était présente mais en faible quantité dans la région d'Al Hoceima et mélangée au chinchard. Ce dernier, qui était d'ailleurs prépondérant, a été rencontré sous forme de couches denses sur le fond, ou de bancs près du fond, de la côte jusqu'aux profondeurs de 100 à 120 mètres, principalement dans la région de Oued Laou et depuis Al Hoceima jusqu'au Cap Milonia.

Lors de la première campagne de prospection la température superficielle était de 16 à 17°C alors qu'à la deuxième campagne, la température superficielle n'était que de 15°C excepté au Cap Milonia où elle était plus basse (14°C en moyenne).

Par ailleurs, l'analyse des débarquements montre que l'allache est présente en faible quantité dans la région orientale du Maroc, à l'est de Nador.

Unités de population

3. Les seules données disponibles concernent les moyennes vertébrales des sardines pêchées dans la zone d'Al Hoceima de 1975 à 1977 (Tableau 1). L'analyse de variance montre qu'il n'existe pas de différence significative d'un mois à l'autre, ni d'une année à l'autre. L'a L'analyse de

Pêcherie

4. Elle est caractérisée par une flottille artisanale. 56 sardiniers, dont 29 sont basés à Al Hoceima, exploitent les ressources pélagiques, principalement la sardine. L'utilisation du lamparo est presque générale (voir annexe 11).

Effort de pêche des sardiniers

5. L'effort de pêche des sardiniers marocains tient compte du nombre de sorties des bateaux, et de leur jauge brute. Cette unité ne tient donc pas compte des effets de la puissance lumineuse sur la puissance de pêche, paramètre sur lequel on ne dispose actuellement d'aucune indication.

6. Par ailleurs, nous ne relevons que l'effort de pêche du port d'Al Hoceima. Mais à partir des captures totales de tous les ports on a estimé l'effort de pêche total méditerranéen (Tableau 2 bis).

Les prises

7. Les captures de poissons pélagiques en Méditerranée marocaine de 1960 à 1977 sont résumées dans le Tableau 2. Il s'agit là des captures des ports d'Al Hoceima, Nador, Martil et Oued Laou. Signalons que les statistiques des prises de Nador sont sous-estimées du fait qu'une partie des captures est débarquée à Melilla.

8 La figure 1 montre que les prises de sardine ont fortement augmenté de 1960 à 1977. Pendant la même période, les captures d'anchois ont augmenté légèrement, surtout après 1972. Pour le maquereau, les captures sont très faibles et constantes.

9. Notons qu'il y a une relation inverse entre les débarquements d'anchois et de sardine: sauf pour l'année 1976, les débarquements d'anchois augmentent chaque fois qu'il y a diminution des débarquements de sardine (Figure 1).

10. La sardine est pêchée pendant toute l'année; les captures ne montrent aucune tendance saisonnière mise à part une légère augmentation du tonnage débarqué au début de l'hiver (mois de novembre) (Figure 2).

Biologie de la sardine

11. a) Saison de ponte

Aucune étude n'a été réalisée dans ce domaine, les premiers renseignements ayant été collectés à partir du début 1976. Ces données bien qu'incomplètes permettent de penser que la ponte a lieu en automne et en hiver. Le nombre de femelles en ponte est maximal au mois de janvier (Figure 3).

b) Migrations

Nous ne disposons d'aucune donnée sur les migrations de sardine. Cependant, deux arguments plaideraient en faveur de déplacements de faible amplitude:

- la sardine est pêchée pendant toute l'année,
- la moyenne vertébrale est stable pendant toute l'année.

c) Croissance

Les clés âge-longueur ont été définies à partir des lectures d'otolithes du premier trimestre 1975 au quatrième trimestre 1977. Les lectures d'âge des sous-échantillons ont été pondérées par le nombre d'individus débarqués par classe de taille. Les longueurs étaient mesurées au $\frac{1}{2}$ cm inférieur.

Ces clés âge-longueur, présentées en annexe, ont permis d'évaluer les paramètres de croissance, K, t_0 l_∞ de l'équation de Von Bertalanffy par la méthode de Ford Walford (voir tableau ci-après).

		K	L_∞	t_o
1976	annuelle	0,35	20,99	- 2,42
1977	1° trimestre	0,45	20,36	- 1,68
	2° trimestre	0,28	20,89	- 3,59
	3° trimestre	0,25	20,90	- 3,96
	4° trimestre	0,27	21,21	- 1,65

Evaluations

12. Les données disponibles nous permettent d'appliquer les méthodes d'analyse des populations virtuelles (méthode de Pope). Puisque le problème de la structure du, ou des stocks n'est pas encore résolu, on a décidé d'effectuer l'analyse en admettant que la population de sardine d'Al Hoceima est indépendante de celle des zones atlantique, espagnole et algérienne.

Analyse des populations virtuelles

13. Les données disponibles pour faire cette analyse sont les captures en nombre par classe d'âge du premier trimestre 1975 au quatrième trimestre 1977 (Tableau 3). On a effectué une analyse de cohorte sur une base trimestrielle en prenant une valeur de M égale à 0,1 (trimestrielle) et deux valeurs du taux de mortalité par pêche F = 0,1 et 0,2. La valeur annuelle M = 0,4 a été estimée par la formule de Taylor à partir de K = 0,35 et t_o = 2,42 (cf. croissance). Il semble que la valeur la plus probable de F soit 0,2 (trimestrielle). La composition en nombre par classe d'âge et par trimestre, ainsi que les coefficents de mortalité par pêche calculés à partir des deux valeurs de F sont donnés dans les tableaux 4 et 5.

Conclusion

14. Une analyse objective et complète de la pêcherie semble prématurée. En effet, aucune cohorte n'est complète. Cependant, on constate que le coefficient de mortalité par pêche calculé par la méthode de Pope augmente dans le même sens que l'effort de pêche (Tableau 3). Par ailleurs, et bien que les données soient incomplètes, il semblerait qu'il y ait une augmentation des effectifs dans la pêcherie.

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Tableau 1 - Moyennes vertébrales mensuelles et annuelles

Mois	1975		1976		1977	
	Moyenne vertébrale	Effectif	Moyenne vertébrale	Effectif	Moyenne vertébrale	Effectif
Janvier			51,28 ± 0,12	100	51,33 ± 0,10	100
Février			51,33 ± 0,12	100	51,30 ± 0,11	100
Mars			51,28 ± 0,13	100	51,34 ± 0,12	100
Avril	51,31 ± 0,12	100	51,19 ± 0,11	100	51,28 ± 0,11	100
Mai	51,33 ± 0,12	100	51,38 ± 0,11	100		
Juin	51,31 ± 0,12	100	51,28 ± 0,12	100		
Juillet	51,29 ± 0,12	100	51,18 ± 0,11	100	51,16 ± 0,12	100
Août	51,25 ± 0,12	100	51,25 ± 0,10	100	51,30 ± 0,13	100
Septembre	51,25 ± 0,11	100	51,35 ± 0,12	100	51,31 ± 0,11	100
Octobre	51,36 ± 0,11	100	51,20 ± 0,11	100	51,29 ± 0,12	100
Novembre	51,31 ± 0,11	100	51,27 ± 0,12	100	51,27 ± 0,11	100
Décembre			51,36 ± 0,11	100		
Moyenne annuelle	51,30 ± 0,04		51,28 ± 0,03		51,29 ± 0,02	

Tableau 2 - Capture de poissons pélagiques en Méditerranée marocaine de 1960 à 1976 (en tonnes)

Espèces	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Sardine	2 259	1 833	2 664	4 264	6 366	4 995	7 255	4 621	5 043	6 742	6 349	10 022	13 455	11 249	14 425	11 629	15 651
Maquereau	8	12	108	35	199	184	128	467	446	1 382	735	108	93	296	296	47	205
Anchois	693	970	979	1 135	1 115	1 528	224	811	2 136	419	803	302	241	3 249	949	1 232	3 745
Thonidés	45	6	78	53	22	39	118	57	24	27	30	662	106	605	155	122	763
Divers	-	821	90	3	5	-	-	3	3	7	35	-	67	495	874	-	367

Tableau 4bis - Effort de pêche des sardiniers en Méditerranée.

Année	Nombre de sorties des bateaux (Al Hoceima)	f = TJP x sorties (Al Hoceima)	F calculé par la méthode de Pope	Prises (en tonnes) (Al Hoceima)	cpue (Al Hoceima)	Prises totales (tonnes) Méditerranée marocaine	f total = Prises totales / cpue
1974	3.657	163.451	. .	8.949	0,05475	14.425	263.470
1975	3.555	169.427	0,4	8.150	0,04810	11.629	241.767
1976	3.548	178.939	0,4	7.840	0,04381	15.651	357.247
1977	4.575	228.525	0,5	8.018	0.03586	(16.000)	(446.180)

( ) Estimation

Tableau 3 - Nombre de sardines (en milliers) pêchées par groupe d'âge et par trimestre - (1er trimestre 1975 - 4ème trimestre 1977)

Année	Groupe d'âge	0	I	II	III	IV	V
1975	1er trimestre		7 878	16 511	1 678	1 989	119
	2e trimestre		13 789	17 030	5 546	1 976	179
	3e trimestre	505	8 224	29 183	20 602	5 536	1 616
	4e trimestre	346	5 189	17 799	17 545	7 024	2 409
1976	1er trimestre		7 206	30 258	7 980	10 084	796
	2e trimestre	2 265	9 146	16 435	9 184	3 365	337
	3e trimestre	4 972	4 591	18 393	14 147	2 081	95
	4e trimestre	2 065	7 025	20 118	20 294	7 125	1 230
1977	1er trimestre		6 120	24 039	4 616	5 960	565
	2e trimestre		3 136	10 259	17 547	723	548
	3e trimestre	569	2 344	14 761	12 915	10 616	5 895
	4e trimestre	2 551	14 552	41 337	9 460	5 111	3 241

Tableau 4 - Population (en milliers) calculée par la méthode de Pope

M = 0,10 trimestriel
F = 0,20 trimestriel

Trim. / Gr. d'âge	75 - 1	75 - 2	75 - 3	75 - 4	76 - 1	76 - 2	76 - 3	76 - 4	77 - 1	77 - 2	77 - 3	77 - 4
0-1												
0-2						181 932 .01						
0-3			733 267 .00				162 464 .03				16 915 .04	
0-4				663 006 .00				142 274 .02				147 764 .20
1-1	453 542 .02				599 584 .01				126 771 .05			
1-2		402 888 .04				535 672 .02				108 885 .03		
1-3			351 431 .03				475 996 .01				95 540 .03	
1-4				310 165 .02				426 332 .02				84 219 .20
2-1	333 381 .05				275 713 .12				379 079 .07			
2-2		285 950 .07				220 693 .08				320 138 .03		
2-3			242 539 .14				184 058 .11				279 914 .06	
2-4				191 698 .10				149 047 .15				239 236 .20

Chiffres supérieurs: population
Chiffres inférieurs: taux de mortalité par pêche

(à suivre)

Tableau 4 - (Suite)

Trim. / Gr. d'âge	75 - 1	75 - 2	75 - 3	75 - 4	76 - 1	76 - 2	76 - 3	76 - 4	77 - 1	77 - 2	77 - 3	77 - 4
3-1	176 210 .01				156 525 .06				115 726 .04			
3-2		157 845 .04				134 039 .08				100 323 .20		
3-3			137 549 .17				112 547 .14				74 084 .20	
3-4				104 862 .19				88 380 .28				54 749 .20
4-1	37 812 .06				78 194 .15				60 665 .11			
4-2		32 322 .07				61 160 .06				49 223 .02		
4-3			27 366 .24				52 139 .04				43 851 .29	
4-4				19 496 .48				45 198 .18				29 580 .20
5-1	21 228 .01				10 959 .08				34 119 .02			
5-2		19 094 .01				9 159 .04				30 335 .02		
5-3			17 107 .11				7 965 .01				26 927 .26	
5-4				13 942 .20				7 119 .20				18 757 .20

Chiffres supérieurs: population
Chiffres inférieurs: taux de mortalité par pêche

Tableau 5 - Population (en milliers) calculée par la méthode de Pope — M = 0,10 trimestriel, F = 0,10 trimestriel

Trim. / Gr. d'âge	75 - 1	75 - 2	75 - 3	75 - 4	76 - 1	76 - 2	76 - 3	76 - 4	77 - 1	77 - 2	77 - 3	77 - 4
0-1												
0-2						321 028 .01						
0-3			1 266 628 .00				288 324 .01				31 704 .02	
0-4				1 145 612 .00				256 157 .01				228 146 .10
1-1	602 626 .01				1 036 263 .01				229 816 .03			
1-2		537 786 .03				9 030 795 .01				209 125 .02		
1-3			473 491 .02				833 518 .01				179 907 .01	
1-4				420 610 .01				749 832 .01				160 557 .10
2-1	413 927 .04				375 648 .09				671 793 .04			
2-2		358 831 .05				311 118 .06				584 007 .02		
2-3			308 485 .11				265 877 .10				519 569 .03	
2-4				251 369 .08				223 080 .10				456 084 .10

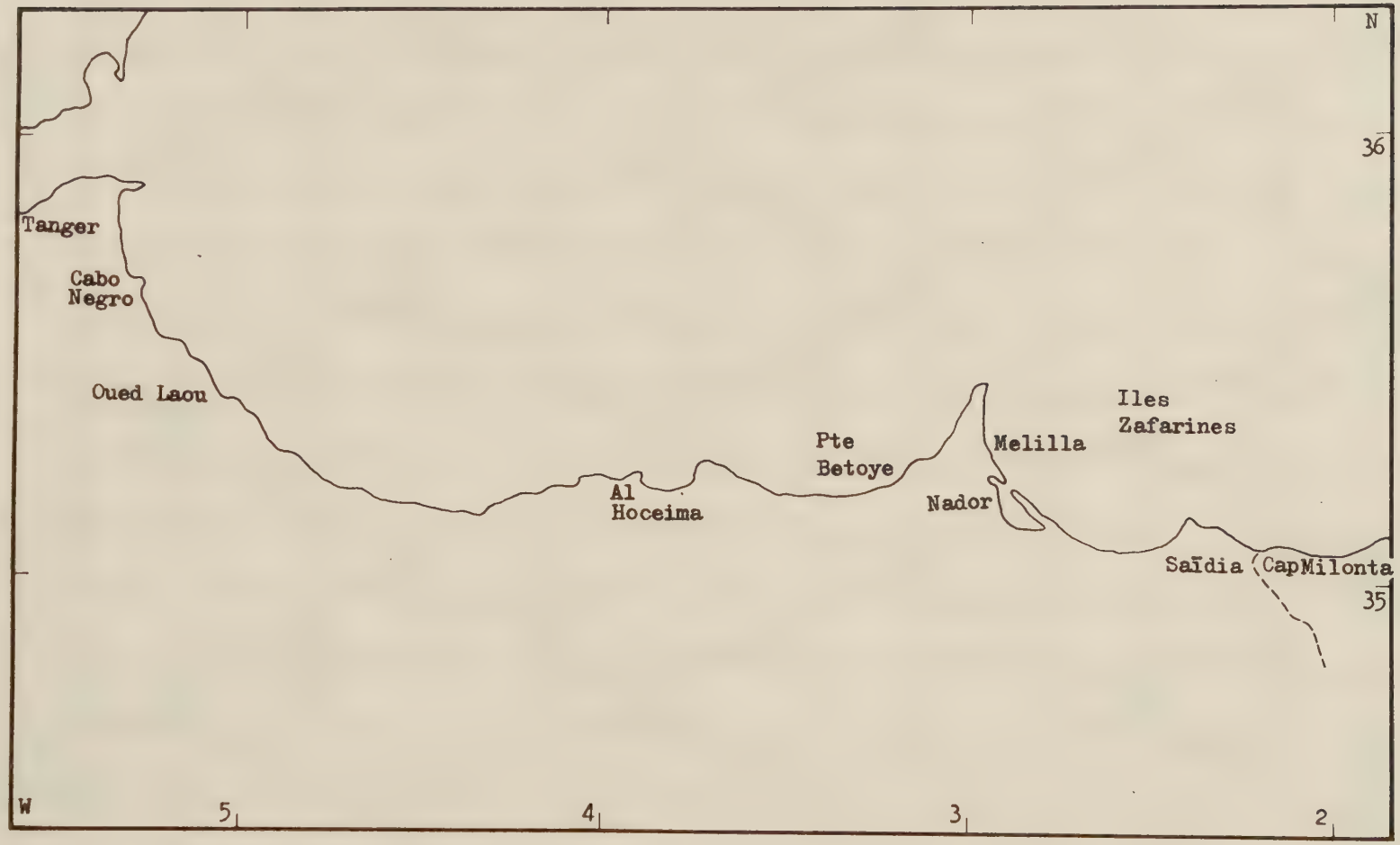
Chiffres supérieurs: population
Chiffres inférieurs: taux de mortalité par pêche

(à suivre)

Tableau 5 - (Suite)

Trim. / Gr. d'âge	75 - 1	75 - 2	75 - 3	75 - 4	76 - 1	76 - 2	76 - 3	76 - 4	77 - 1	77 - 2	77 - 3	77 - 4
3-1	227 286 .01				210 517 .04				182 714 .03			
3-2		204 061 .03				182 893 .05				160 936 .12		
3-3			179 366 .13				156 752 .10				128 930 .11	
3-4				142 700 .14				128 378 .18				104 375 .10
4-1	50 806 .04				112 431 .10				96 857 .07			
4-2		44 079 .05				92 140 .04				81 971 .01		
4-3			38 005 .17				80 171 .03				73 482 .17	
4-4				29 122 .29				70 562 .11				56 391 .10
5-1	38 286 .003				19 669 .04				57 070 .01			
5-2		34 530 .01				17 040 .02				51 101 .01		
5-3			31 073 .06				15 098 .01				45 717 .15	
5-4				26 570 .10				13 571 .10				35 759 .10

Chiffres supérieurs: population
Chiffres inférieurs: taux de mortalité par pêche



Carte 1 - Méditerranée marocaine et principaux ports de pêche

Figure 1 - Débarquements (en tonnes) de sardine, d'anchois et de maquereau dans les ports méditerranéens (1960-1976)

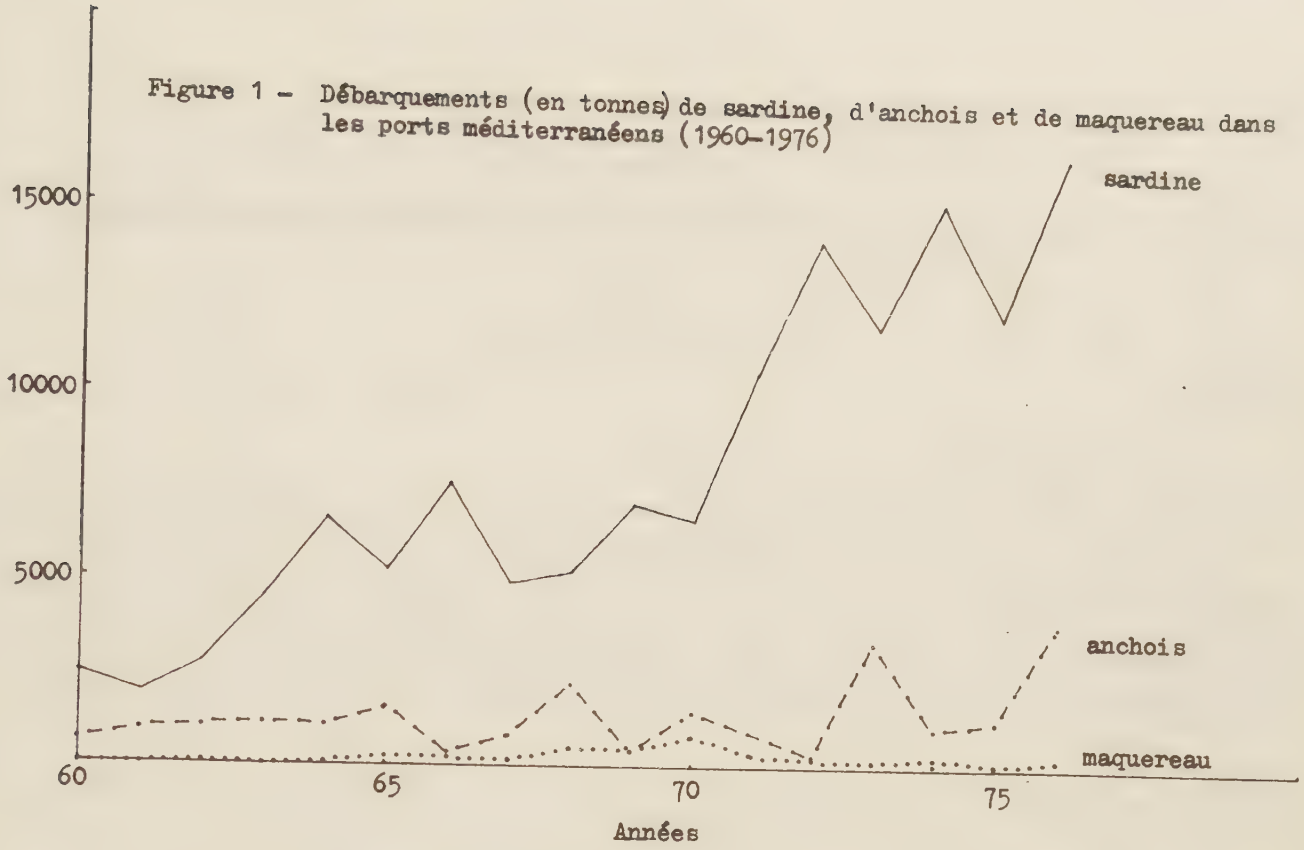


Figure 3 - Pourcentage de sardines femelles en ponte (observations 1976-1977)

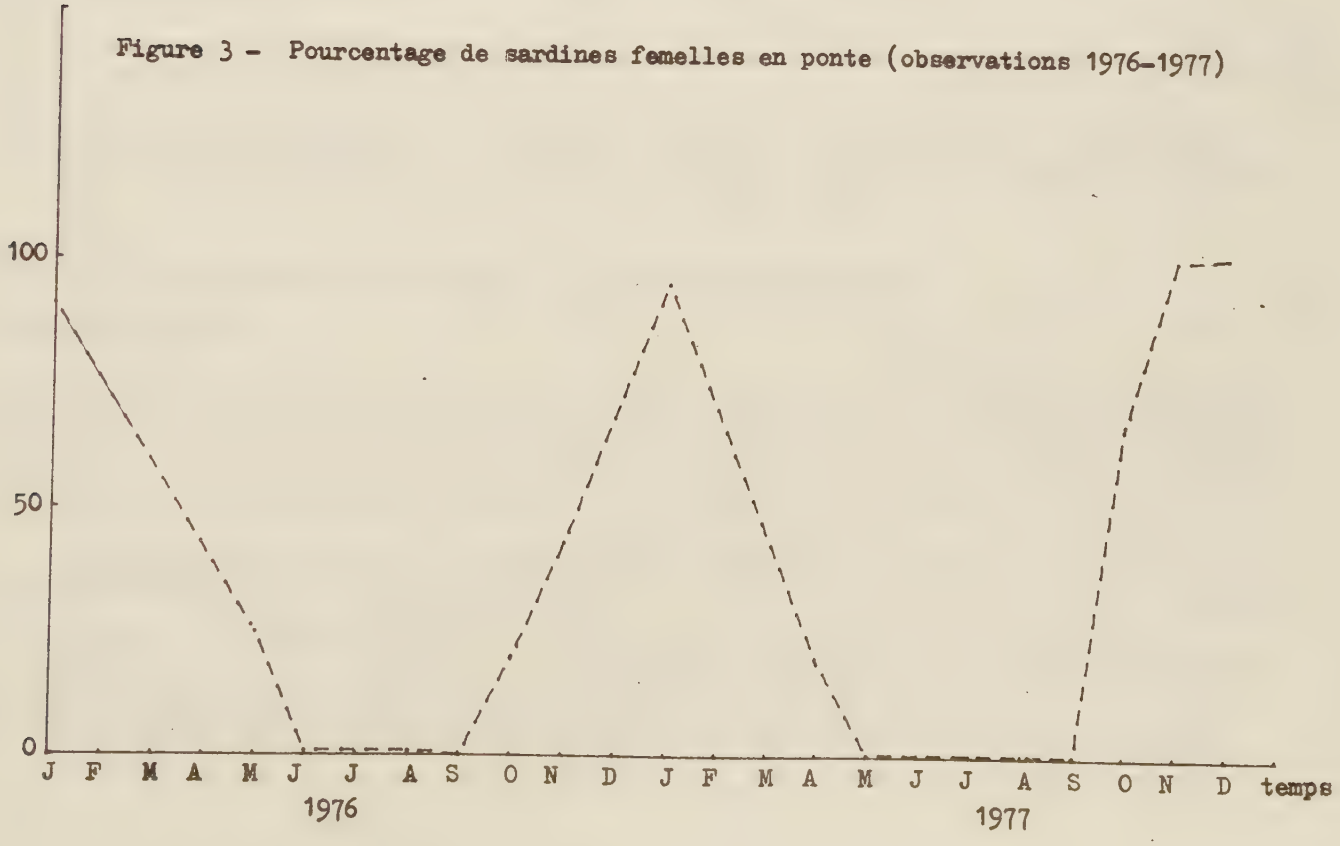
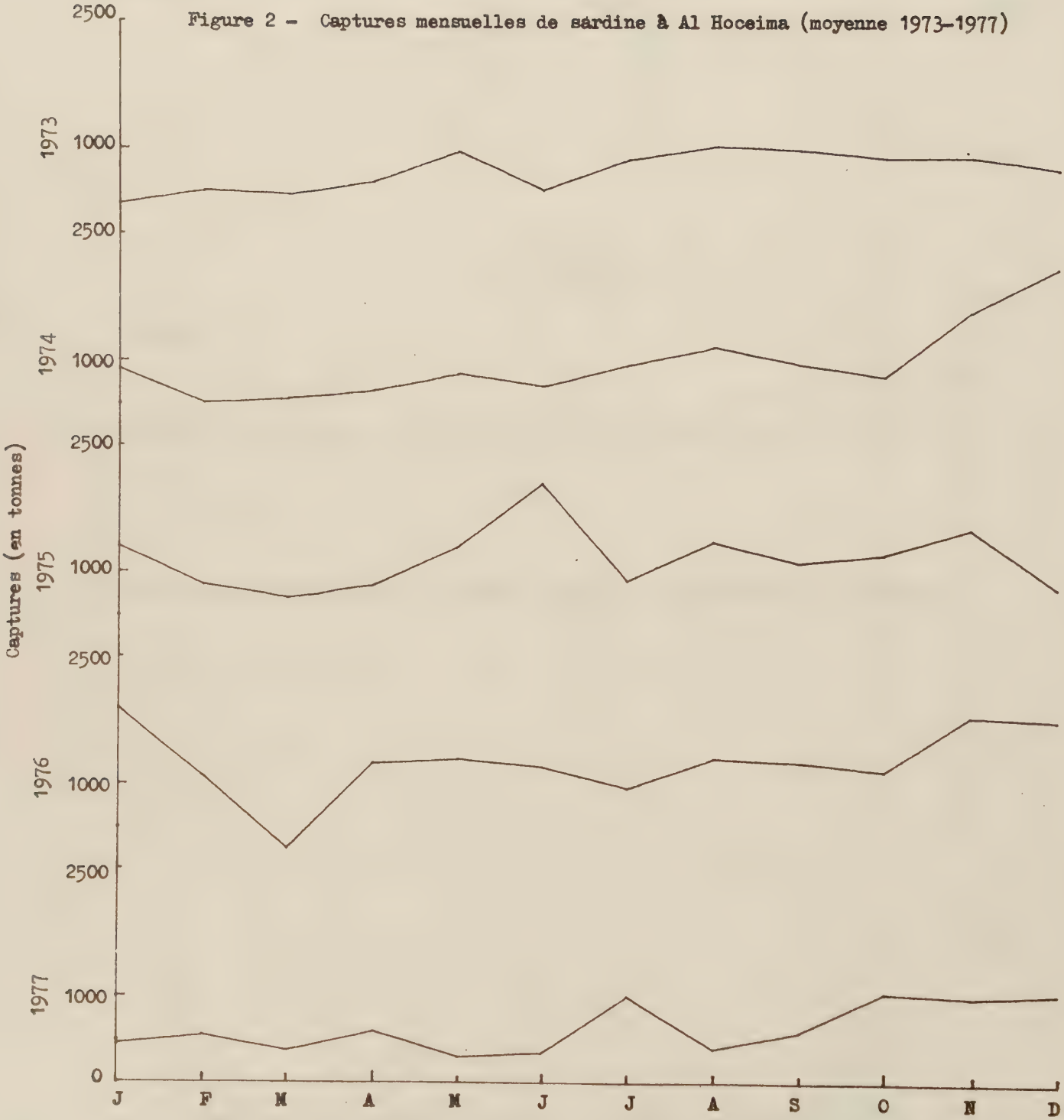


Figure 2 - Captures mensuelles de sardine à Al Hoceima (moyenne 1973-1977)



RAPPORT SUR LA REUNION DE TRAVAIL POUR LE DEPOUILLEMENT DES STATISTIQUES SUR LA PECHE ITALO-TUNISIENNE DANS LA SOUS-ZONE 37.5

Ancône, Italie, 12-16 décembre 1977

par

M. Bouhlal
INSTOP, Salammbô, Tunisie

1. Lors de sa sixième session, le Groupe de travail du CGPM sur l'évaluation des ressources et les statistiques de pêche avait recommandé qu'une réunion soit organisée entre MM.D. Levi, du Laboratoire de technologie de la pêche d'Ancône (Italie) et M. Bouhlal, de l'Institut national scientifique et technique d'océanographie et de pêche de Salammbô (Tunisie). Le but de cette réunion était de parfaire l'évaluation des stocks de la région sicilo-tunisienne en considérant un sous-secteur plus homogène que l'ensemble de la sous-zone 37.5 et en tentant des évaluations monospécifiques. Enfin, il avait été recommandé d'améliorer le traitement des données tunisiennes d'effort de pêche, lesquelles étant plus détaillées devraient conduire à des estimations plus correctes de la mortalité par pêche et de l'abondance des stocks.

2. Cette réunion fut organisée par le CGPM; elle eut lieu à Ancône (Italie) du 12 au 16 décembre 1977. Le travail a porté sur les points suivants:

- inventaire des statistiques disponibles sur les flottilles des deux pays opérant dans la sous-zone 37.5;
- définition, pour les évaluations, d'un secteur géographique plus petit et plus homogène que l'ensemble de la sous-zone 37.5;
- application d'un modèle global aux séries de données ainsi élaborées, relatives aux grands ensembles démersaux et pélagiques d'une part et à quelques espèces particulièrement importantes (merlu, rouget, crevettes) d'autre part.

INVENTAIRE DES STATISTIQUES ITALIENNES ET TUNISIENNES DISPONIBLES

Données italiennes

3. Les chiffres relatifs à la pêche italienne en 1975 et 1976 n'étaient pas encore publiés, mais il a été possible de se les procurer auprès de l'INSTAT (Institut national de statistiques). Dans le traitement, on n'a considéré que la pêche dans le secteur sicilo-tunisien, éliminant du traitement les statistiques relatives aux régions suivantes: Pouilles, Basilicate, Calabre. Sur les données retenues, les traitements suivants ont été effectués:

- ventilation entre chalutiers et sardiniers de captures de certaines espèces exploitées simultanément par les deux types de pêche;
- ventilation par aires de pêche des données originales établies par ports de débarquement;
- calcul de facteurs de conversion permettant de passer des quantités débarquées aux captures;

- élimination, des inventaires des flottilles, des navires de tonnage supérieur à 200 tonneaux (TJB) opérant normalement dans l'Atlantique.

4. Enfin, les données du secteur de Trapani ont été isolées de façon à pouvoir les combiner avec les données de la pêche tunisienne, et tenir compte du chevauchement dans les activités des deux flottilles. Pour cela on a:

- comparé les cpue (prise par tonneau) des chalutiers et senneurs tunisiens et italiens;

- utilisé les cpue tunisiennes plus précises (disponibles en prise par jour de mer) pour estimer l'effort de pêche global (flotte de Trapani et flotte de Tunisie orientale).

Données tunisiennes

5. Les statistiques tunisiennes n'ont pas été collectées ni dépouillées selon la même procédure tout au long de la période 1969/76. Pour la période 1959 à 1967, on ne dispose pas de renseignements sur l'effort de pêche. La ventilation des statistiques par espèces n'a pas été parfaitement respectée et des différences apparaissent d'une région à l'autre. A partir de 1967, un journal de pêche est introduit pour recueillir des données d'effort dans les flottilles de chalutiers et de sardiniers. Les captures correspondantes pour les espèces principales sont également enregistrées sur ce cahier. Par contre, la collecte des statistiques reste inchangée dans le secteur pêche artisanale.

6. Pour la période 1959/67, les statistiques publiées par la Direction des pêches se rapportent aux productions totales débarquées par régions — sans précision d'espèces. En 1968, un progrès est réalisé: des renseignements sur les prises par groupes d'espèces sont publiés. De 1969 à 1971 des captures, par espèces principales, par port et par types de pêche sont publiées. Après 1971, aucune statistique n'est publiée. Les données d'effort de pêche tirées des journaux de pêche ne sont pas non plus disponibles.

7. Pour rendre compatibles les données tunisiennes et italiennes et évaluer l'état des stocks pluri- ou monospécifiques importants, on a entièrement repris le traitement des statistiques tunisiennes en partant des fiches originales. Ce dépouillement a porté sur la période 1965/76, en considérant séparément les trois types de pêche (au chalut, au feu (poisson bleu) et artisanale). Les statistiques tunisiennes ont été ventilées par espèces et par sous-zones (37.3 et 37.5).

8. Les données tunisiennes d'effort sont plus détaillées que celles dont disposent la plupart des autres pays méditerranéens, et notamment l'Italie, puisque l'on connaît, en plus des caractéristiques principales des bateaux (jauge et puissance), leur activité (nombre de marées et de jours de mer).

9. Ce travail de dépouillement a été pratiquement achevé avant la réunion d'Ancône. Seules les statistiques de 1967 et 1968 n'ont pu être complètement traitées. Elles le seront incessamment.

DEFINITION DU SECTEUR GEOGRAPHIQUE D'EVALUATION

10. On admet que le sud de l'Adriatique diffère, par la nature des fonds, les peuplements et les modes de pêche, de la Méditerranée centrale. Au large des Pouilles, du Basilicate et de la Calabre, le chalutage est peu développé par comparaison à la pêche artisanale. La même remarque s'applique à la pêche grecque dans la sous-zone 37.5. Au contraire, on peut admettre qu'au sud de la Sicile, à l'est de la Tunisie et au large de la Libye, l'exploitation présente de grandes similitudes et, en première approximation, les stocks qu'on y exploite peuvent être considérés comme homogènes.

EVALUATIONS

11. Les données siciliennes et tunisiennes (sud-est) ont servi pour calculer la relation entre la cpue et l'effort de pêche total au chalut. Comme mesure de l'effort exercé sur l'ensemble des espèces démersales, on a utilisé successivement la jauge brute totale (total des deux pêcheries italienne et tunisienne), le nombre total de jours de mer et le produit jauge brute x jours de mer (ces deux derniers étant déduits des cpue tunisiennes et des captures totales). Pour les évaluations portant séparément sur les principales espèces, les cpue et les effort ont seulement été exprimés en prise par tonneau de jauge et en jauge totale d'une part ainsi qu'en prise par jour de mer et nombre total de jours de mer d'autre part. Dans ce traitement, on n'a pas eu en effet le temps de combiner le tonnage total et l'activité des navires pour évaluer l'effort de pêche.

12. En ce qui concerne la pêche pélagique, l'effort de pêche combiné des deux pêcheries a été exprimé en jauge brute (unités italiennes standard) et en jours de mer (unités tunisiennes standard).

13. Une corrélation significative négative apparaît dans tous les cas entre cpue et effort total. Pour l'ensemble du stock démersal, le potentiel maximum de capture ne paraît pas encore tout à fait atteint, mais il n'y a pas d'intérêt à augmenter l'effort, le surcroît que l'on peut en escompter étant négligeable par rapport à l'accroissement d'effort correspondant. Les mêmes conclusions s'appliquent lorsque l'on analyse séparément les statistiques relatives au merlu et au rouget. Les stocks de crevettes n'ont pas été encore analysés, parce que l'on a jugé qu'il serait préférable de distinguer un stock italien et un stock tunisien. D'autres espèces fortement exploitées devraient être également évaluées séparément afin d'arriver à une meilleure vision de l'état des stocks démersaux dans le secteur étudié.

14. Un ce qui concerne les stocks pélagiques on a préféré considérer séparément la pêche italienne et la pêche tunisienne. On peut noter que dans le secteur étudié, le volume de leurs captures respectives est comparable (18 000 tonnes/an pour la Sicile, contre 11 000 tonnes pour la Tunisie).

15. Que l'effort soit exprimé en jauge brute ou en nombre de marées, on constate qu'il existe une bonne corrélation entre la cpue et l'effort de pêche total. Les graphiques correspondant à cette évaluation et les conclusions que l'on peut en tirer ont été reprises dans le rapport de la septième session du Groupe de travail sur l'évaluation des ressources et les statistiques de pêche (section 3.5, Pêche pélagique).

CONCLUSIONS

16. Cette réunion et le travail auquel elle a donné lieu ont démontré l'importance de la collaboration entre chercheurs italiens et tunisiens pour l'évaluation de stocks dont plusieurs sont conjointement exploités par ces deux pays. De telles réunions devraient être organisées périodiquement.

17. Ce travail a également démontré combien il était important de recueillir et de traiter des statistiques plus détaillées de capture et d'effort de pêche. Ces analyses classiques devraient être complétées par des évaluations directes de biomasse (par chalutage pour les stocks démersaux, par méthodes acoustiques pour les stocks pélagiques). Etant donné qu'Italie et Tunisie participent à l'exploitation de mêmes stocks, il serait souhaitable que les deux pays puissent collaborer pour l'exécution de telles campagnes.

M-43
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